JOURNAL

OF THE

American Society of Naval Engineers.

GENERAL INDEX,

VOLUMES I-XVI.

1889—1904.

PUBLISHED BY THE SOCIETY.

WASHINGTON, D. C.
R. BERESFORD, PRINTER, 618 F STREET, N. W.
1905.

OFFICERS OF THE SOCIETY.

President:

Commander A. F. Dixon, U. S. Navy.

Secretary-Treasurer:

Lieutenant Chas. K. Mallory, U. S. Navy (retired)

Council:

Captain George W. Baird, U. S. Navy.
Commander A. F. Dixon, U. S. Navy.
Commander J. K. Barton, U. S. Navy.
Commander W. M. Parks, U. S. Navy.
Lieutenant Chas. K. Mallory, U. S. Navy, Retired.

The subscription price of the Journal is $5.00 per annum, payable in advance.

Make cheques, drafts and postal orders payable to

AMERICAN SOCIETY OF NAVAL ENGINEERS.

Make postal orders payable at Station C, Washington, D. C.

Advertising rates will be furnished on application.

It is earnestly requested that prompt information be given of changes in address, or of failure to receive the Journal.

Address all communications for the Society to

AMERICAN SOCIETY OF NAVAL ENGINEERS,
Navy Department, Washington, D. C.

JOURNAL

OF THE

American Society of Naval Engineers.

GENERAL INDEX,

VOLUMES I–XVI.

1889–1904.

PUBLISHED BY THE SOCIETY.

WASHINGTON, D. C.
R. BERESFORD, PRINTER, 618 F STREET, N. W.
1905.

AIDS FOR REFERENCE TO THE INDEX.

Names of all ships and vessels are printed in *italics*.

Nationality of each naval vessel, man-of-war, warship, etc., follows name of vessel *except for United States naval vessels.* These are not so designated.

All merchant steamers, yachts, etc., are so designated, but nationality is not given.

Prefixes to names of ships have been used in the index to correspond to official designations. Failing to find a name desired, the following frequently-used prefixes may be of aid in further search :

Abdul, Admiral, Almirante, Amiral, Amiraglio, Captain, Capitan, Dom, Don, Emperor, Emperador, Imperator, Ersatz, Erzherzog, General, Graf, Hertog, Infanta, Infante, King, Kaiser, König, Kaiserin, Königen, Kurfürst, Kniaz, Lieutenant, Teniente, Marshal, Marechal, Marques, Ministro, President, Presidente, Prince, Prinz, Fürst, Princess, Prinses, Princesa, Principesa, Prinzessin, Queen, Rainha, Reina, Regina, Re, City of, Ville de, El, La, Le.

Look for the *prominent word* of the subject under investigation. If not successful at first glance try another similar word or combination. Absolute cross-indexing has been impossible, but salient words of subjects and titles are cross-indexed with considerable care.

It will be noted that data for vessels occur under several heads in addition to the entries under vessels' names. For example, Boiler data, Hull data, Engine data, Trials, Weights, Propeller data, Performance data, etc.

GENERAL INDEX, VOLUMES I—XVI.

A

A3, Fr., dimensions.....ix 175
Abarenda, auxiliary navy, x 535; data.....x 824
Abdul Hamid, Turk., data, xiv 997; trials.....xvi 706
Abdul Medjid (see *Medjidia*), Turk., data.....xiv 997
Aberdeen, mer. str., des., vi 642; machinery.....vii 444
Aboukir, Br., launch and des., xii 835; trials.....xiv 206, xvi 717
Abraham, A.—Special nickel-, chromium- and silicon-steels.....xi 144
Abruil, Abreu or *Almirante Abreu*, see *Albany*.
Abuse of phosphorus.....xvi 981
Accessories, effect on size and cost of warships.....xv 350
Accident on the *Garibaldi*, xii 1047; to H. M. S. *Seagull*, iii 457; to the *City of Paris*.—Mueller, vi 290; to the machinery of *La Gascogne*, vii 139; to the machinery of the *Cincinnati*, xi 214; to the torpedo boat *Ericsson*.....vii 572
Accidents to machinery, see also Breakdowns, casualties and repairs.
Accomac, auxiliary navy, x 535; data.....x 824
Account of the experiments made on the double-screw steel ferryboat *Bergen*, etc.—Isherwood.....ii 251
Acetylene, future of.....xi 226
Achilles class compared to *Minotaur* class, Br.....xvi 1278
Aco, mer. str., engine data.....vii 441
Actif, Fr., early Belleville boilers.....xvi 410
Action-reaction steam turbines.....xvi 206
Active, auxiliary navy, x 535; data.....x 824
Active, Br., des.....i 267
Acts of Congress, 1882–1889: new vessels.....i 236
Actual performance of Babcock & Wilcox boilers as installed in U. S. S. *Marietta*, with general observations on practical requirements and the successful operation of marine water-tube boilers.—Dinger.....xv 59
Adamastor, Port., des., vii 606; launch.....viii 852
Adder, named, xii 825; data, xiii 476; launch, xiii 767; trials, contract...xv 39
Adler, Aus., boiler explosion.....xii 197
Adler, Rus., trial.....ii 426
Admiral Dewey, mer. str., launch.....x 1218
Admiral Oushakoff, Rus., launch, vi 210; des., vii 175; trials.....vii 839
Admiral Sampson, mer. str., launch.....x 1218
Admiral Schley, mer. str., launch.....x 1218
Admiral Senjavin, Rus., trials.....ix 185
Admiral Watson, mer. str., launch.....x 1218
Admiralty and the Navy Program, Br.....xvi 1266

Admiralty Boiler Committee, Br., report, v 586; interim report, xiii 353; report....xiv 866
Admiralty mixture for condenser tubes....xv 202
Adria, mer. str., des., viii 648; speed....viii 867
Adulterations in olive oil, method of detecting....i 162
Advanees made in the mathematical theory of naval architecture, etc.—Reed....ix 730
Advantages of mechanical draft over chimneys for boiler furnaces....xi 222
Adventure, Br., scout, launch, xvi 1324; des....xvi 985
Adzuma, Jap., data....x 581
Aegir, formerly *T*, Ger., des., vii 604; electricity for all auxiliaries, viii 550; data and trials, ix 813; coal consumption and boiler data, Thornycroft, xiv 117; rebuilt....xiv 972
Aegusa, yacht, des., ix 448; auxiliary navy, data....x 534
Aeolus, Br., work on....ii 421
Africa, Br., machinery contracts....xvi 338
Africa (two), mer. strs., trials....vi 590
Agamenticus, see *Terror*.
Age of nickel-steel....xi 1030
Agordat, It., dimensions, viii 199; launch, xi 1111; trials....xiii 787, 1117
Ahter, Turk., launch....vi 810
Aileen, auxiliary navy, x 535; data....x 824
Air admitted over grates of water-tube boilers....x 635
Air chambers on long suction pipes for steam pumps....x 1119
Air compressors, duplex, *Terror* and monitors....ix 16
Air compressor, efficiency of....x 1034
Air for transmitting power on shipboard....iv 182
Air ice machine, Allen....iv 771
Air, liquid, cost of....xi 724
Air-lubricated journals, experiments with....ix 267
Air pressure, effect of on power....v 743
Air-pump data, various vessels in the navy....vi 532
Air pumps.—Bailey, vi 518; discussion—McKean, vi 534; Haswell, vi 535; McFarland, vi 536; Forsyth, vi 538; Hollis, vi 541; Wheeler, vi 546; Dicky, vi 547; Baird, vii 132; Bailey, reply....vii 136
Air pumps, independent, boiler committee recommends....xiv 873
Ajax, Br., des....i 265
Akagi Jap., mention in battle of Yalu....viii 372
Akashi, Jap., launch and des., x 267; data....xiv 357
Akatsuki, Jap., trials....xiv 343
Akebono, Jap., des....xi 803, xii 257
Akitsushima, Jap., data....xiv 357
Alabama, coals of....i 118
Alabama, bids and engines, viii 797; launch, x 533; battery compared to *Canopus*, Br., x 786; preliminary trial, xi 1087; trial, xii 825; contract trials, xii 855; notes on machinery, xiv 1; progressive trials, xiv 181; comparison with *Mississippi*....xvi 38
Alabama, mer. str., launch and des....iv 858

Alameda, comparative performance, coal and oil.....xvi 806
Alarm, Br., launch, iv 832; details, v 226; des., v 510; trials, v 748; des. and trial.....vi 200
Alaska, mer. str., dimensions and data, iv 102.....vi 162
Alaskan copper deposits.....xiii 180
Alaskan, mer. str., des.....xiii 310
Albany, data, x 534; des., xi 513; note, xi 780; stability, xi 1045; trials, xii 236; contract trials, xii 281; steaming radius, xiii 54; coal consumption.....xv 366, 379
Albatross, coals of Pacific Coast, notes on, during cruise, i 69; des.—Isherwood, vi 497; auxiliary navy, x 535; data, x 824; Fish Commission steamer, des. and trials.....vi 497
Albatross, Br., note, viii 622; data, ix 420; trial.....xiii 271
Albemarle, Br., launch, xiii 487; trials.....xvi 258, 260
Alberta, mer. str., trial and des.....iv 860
Albion, Br., note, viii 378, 807; launch and des., x 841; speed, xiii 488; trials.....xiii 277, xiv 206
Alcedo, yacht, des., vii 854, ix 446; pump.....ix 844
Aldrich, Prof. Wm. S.—Spirally-welded tubes, i 207; discussion, steam consumption of the *Minneapolis*, x 69; central power plants on board ship vs. distribution of power, x 95; systems and efficiency of electric transmission in factories and mills, xii 402; electric transmission of power for navy yards.....xiv 448, 814, 1109
Alert, test of Babcock & Wilcox boiler, xi 285; boilers, performance data.....xvi 153, 163
Alert, Br., des., v 518, vi 203; trials, vii 428; coal consumption.....viii 172
Alexander, data.....x 824
Alexander Holly, mer. str., launch.....viii 864
Alexander, James Nelson.—U. S. torpedo-boat destroyers *Bainbridge*, *Barry* and *Chauncey*, xiv 1003; *Denver*, second official trial, xvi 612; discussion, the marine steam turbine.....xiii 439
Alexander McDougall, mer. str., des.....x 900
Alexandra, Br., speed and power.....vi 493
Alexandra, mer. str., launch.....ix 839
Alfonzo XIII, Sp., des., i 168; characteristics.....iii 142
Alger, Fr., characteristics.....iii 142
Algerine, Br., dimensions, vi 615; trials.....viii 393
Algiers floating dry dock.....xi 988
Algoa, mer. str., data.....viii 428
Algonquin (see *Accomac*), data, x 534; des.....x 828
Alice, data.....x 534
Alicia, see *Hornet*.
Alignment of shafting and boring out stern tubes as practiced at Union Iron Works.....v 7
Allan Line, turbines for Atlantic liner.....xv 1255
Allderdice, W. H., Lt. Comdr., U. S. N.—Reply to Chief Engineer Isherwood on analysis of engine trials, iii 65; notes on analysis of engine trials.....ii 510

Alleghany, mer. str., des.....vii 193
Allen dense-air ice machine.....iv 771
Allen.—Discussion, recent trials of the cruiser *Diadem*.....x 437
Allen, Jeremiah M.—Obituary.....xvi 373
Aller, mer. str., data.....vi 162
Alliance, propellers, notes on action of, progressive trials.....i 125
Alloy bolts, standard U. S., safe load.....xiii 341
Alloys.—Bayley,.....xv 196
Alloys, aluminum bronze, iii 490; aluminum, light and heavy, x 760; and metals, effect of temperature on, ii 144; copper, endurance in sea water, xi 336; copper, zinc, iron, iii 493; delta metal, iii 493; de-oxidized bronze, iii 497; for bearings, ix 110; for improving steel, xvi 327; for lining bearings, xiv 1229; galvanic series of, xi 351; improvement of manufacture, xv 196; increased consumption, xv 196; iron, iii 500; iron-nickel for incandescent electric lamps, xi 227; magnalium, xii 808; new chemical and physical aspect, iii 489; Parsons' manganese-bronze, iii 492; phosphor-bronze, iii 496; question of condenser tube, xv 196; silicon-bronze, iii 498; tests for temperature, ii 161; Tobin bronze.....iii 494
Alloys for bearing purposes.—Clamer.....xvi 964
Alma, mer. str., des. and trials.....vii 191, 439
Almaz, Rus., scout, description.....xiii 1126; xvi 369, 396
Almirante Condel, Chili, launch, ii 237; des. and trials.....ii 585
Almirante Lynch, Chili, launch and des., ii 237; des.....ii 585
Almirante Oquendo, Span., speed, viii 638; des.....vii 841
Almirante Quendo, Span., characteristics.....iii 142
Almirante Simpson, Chili, des. and launch, viii 386; speed.....viii 611
Almirante Tamanderé, Brazil, des.....ii 427
Almy, see *Eagle*.
Almy boilers, *Parthenia*, yacht.....x 397
Almy, Darwin.—Water-tube boilers.....x 106
Almy water-tube boiler, evaporative test.....ix 135
Almy, yacht, des. and trials.....iv 131
Alphabetical list of vessels of the U. S. Navy.....xi 1090
Alsace, mer. str., des.....vii 196
Alternating current for electric power transmission.....xii 413, xiv 818, 1109
Alternating-current generators, power plant, Navy Yard, N. Y.....xiii 987
Alternating currents, Bedell & Crehore, book received.....v 529
Alternating currents of electricity.—Knapp.—Book received.....v 529
Aluminum, v 191, 718; xii 1082; alloys, light and heavy, x 760; boat, v 1031; bronze, iii 490; cast, xi 1072; conductors for electric transmission, xiii 188; in the foundry, xiii 188; in shipbuilding, x 765; manufacture of, x 755; methods of working, x 759; production 1898, xii 527; production of, xiii 186; production of high temperatures by, xvi 319; steel, iii 501; thermit, xii 1029; torpedo boat, des. and trials, vi 786; uses of, x 763; yacht *Vendenese*, des.....vi 165
Alvina, yacht, des.....xiii 321
Amazonas, Brazil, see *New Orleans*, des.....ix 142
Amazone, Ger., launch.....xiii 293

America, Hamburg-American, des.....xvi 1339
America, It., repair ship.....vii 76
America, mer. str., dimensions and data.....iv 102, vi 162
America, petroleum tank steamer.....iv 867
American and British blast furnace practice.....xii 1077
American engineer, conquests of.....x 1158
American Line steamers *St. Louis* and *St. Paul*, des. and trials under Subsidy act.....vii 609, 843
American Line freight steamers.....v 757
American Maru, mer. str.....x 605
American register for *City of New York* and *City of Paris*.....iv 320
American Society of Mechanical Engineers, code of 1899 for conducting steam boiler trials, xii 37; May meeting, 1899, xi 444; December meeting 1899, xii 137; May meeting 1900, xii 432; December meeting, 1900.....xiii 161
American steam vessels.—Stanton, book received.....vii 633
American steam yachts.—Cox.....x 393
"American" stokers, *Pennsylvania*, mer. str.....xi 561
American, yacht, launch.....x 936
America's cup races, 1893.....v 998
Amethyst, Br., trials, xvi 343; comparison with *Hamburg*, xvi 360; turbines, compared with *Sapphire*, *Topaze*, *Diamond*, reciprocating engines.....xvi 1242
Amiral Aube, Fr., data, xii 253, xiv 662; trials, xvi 350; boilers, trials..xvi 460
Amiral Cécile, Fr., trials.....i 180
Amiral Duperré, Fr., repairs.....xiii 288
Amiral Gueydon, Fr.. des., x 573; launch and data, x 870, xi 252, 1108; note, ix 810; preliminary trials and mishap.....xiv 1254
Amiral Pothuau, Fr., launch and des., viii 848; trials.....ix 424
Amiral Tréhouart, Fr., speed.....viii 403, 625
Ammen ram *Katahdin*, des.....ii 576
Ammiraglio, It., dimensions.....x 1202
Ammiraglio Saint Bon, It., des., viii 196; data, xiii 788; trials, xiii 1118; xiv 339
Ammunition hoists, electric, for ships.....viii 575
Ammunition hoists, pneumatic, *Terror*.....ix 20
Amphitrite, authorization and data, i 236; experiences in engine room, ix 530; improvements in ventilation, ix 535; reconstructed monitor, ix 528; steaming radius, xiii 54; vs. *Terror*, hydraulic and pneumatic systems compared.....ix 542
Amphitrite, Br., des., viii 827; launch and data, x 862; trials, xi 377; xii 246
Amsler's polar planimeter.—Crockett.....v 665
Anakreon, Rus., trials.....ii 426
Analyses, coal, Clearfield, Pa., xi 885; for boiler trials, xii 48; Lykens Valley anthracite, Niclausse boiler test, x 112; Ohio, "Jackson," xi 94; semi-bituminous, Eureka, Clearfield, Pa., Niclausse boiler tests, x 113; *Ville de Douvres* trials, iv 416, 546; of flue gases, xi 299; *Cincinnati* boiler tests, xii 894; Niclausse boiler test, x 114; *Pennsylvania*, mer.

str., xi 569; *Ville de Douvres*, trials, iv 416, 548; of fuel oil, xv 233; iron castings, x 1053; oil, crude, xvi 757; steels, xi 152; steel, American and German, xiv 146; steels, ferro-nickel and carbon, xi 149; steels, special, nickel, chromium and silicon.....xi 145
Analyses and tests, steel castings.....i 191
Analyses and tensile tests, steel castings.....i 206
Analyses and weights of charges for steel castings.....i 194
Analysis of certain curves arising in engineering investigations.–Durand, v 543
Analysis of engine trials, notes on.....ii 510
Analysis of the results of the experiments made on the paddle-wheel steamer *Ville de Douvres*, etc., etc.—Isherwood.....iv 539
Analysis, rapid, of boiler waters for scale-forming ingredients.....x 1117
Ancona, It., experiments with oil fuel.....iii 282
Andalusia, launch.....viii 867
Andrea Doria, It., trials.....ii 423
Anderson & Lyall's compound boiler.....viii 479
Anderson, M. A., P. A. Engr., U. S. N.—The contract trial of the U. S. S. *New York*, v 613; the United States torpedo boats *Talbot* and *Gwin*, x 493; the U. S. torpedo boat *Morris*.....x 502
Andria, yacht, dimensions.....ix 449
Andromache, Br., performance data.....iii 597
Andromeda, Br., des., vii 418, 813; trials, xi 243, 322; Gibraltar to Malta, xii 736; Malta to Naples.....xii 738
Angler, Br., launch, ix 420; trials.....x 858
Angström valve gears.....iii 538
Angularity of connecting rod and weight of reciprocating parts of steam engine, method of determining influence of.....i 271
Animate and inanimate matter, resemblances between.....xii 200
Anita, yacht, dimensions, viii 213; data.....viii 663
Annapolis, gunboat *No. 13*, named, viii 799; launch, ix 140; data, ix 401; des. and contract trials, ix 560; steaming radius.....xiii 54
Annealing armor plates.....xii 150
Annealing armor plate, electric process.....xii 459
Annealing copper steam pipes.....vii 532
Annealing soft steel, brittleness produced by.....x 965
Annealing steel castings.....v 55
Annett, yacht, des.....ix 843
Annual statement, 1889, ii 249; 1890, iii 148; 1891, iv, 141; 1892, v 253; 1893, vi 227; 1894, vii 199; 1895, viii 220; 1896, ix 218; 1897, x 309; 1898, xi 281; 1899, xii 276; 1900, xiii 330; 1901, xiv 376; 1902, xv 279; 1903.....xvi 380
Annual meeting American Society of Mechanical Engineers, 1900.....xii 137
Annual meeting Naval Architects and Marine Engineers, 1900.....xii 1039
Annual report of the Engineer-in-Chief, 1898, x 1098; 1899, xi 851; 1900.....xii 1017
Anson, Br., des., i 264; coal consumption, xiii 1029, 1031, 1032; defects in machinery.....iii 131
Antelope, Br., des. and trial.....vi 200

Anthracite coal, *Charleston*, iv 361; Lehigh, test under Corliss boilers, i 299; Lykens Valley, analysis..... x 112
Antrim, Br., combination boilers, Yarrow and cylindrical, xiv 920; launch and des., xvi 344, 713; comparison with turbines, xvi 629; trials..... xvi 1023
Apache, mer. str., launch..... xiii 537
Aphrodite, yacht, des..... xi 274
Apollo, Br., performance data..... iii 597
Apparatus for ascertaining the efficiency of screw propellers..... v 970
Apparatus for increasing vacuum in condensers..... xvi 948
Apparatus for testing ships' models at the Naval Construction and Armaments Co., Barrow-in-Furness..... viii 788
Applications of electricity in the Royal Dockyards and Navy, Br..... v 178
Application of the compound steam turbine to the purpose of marine propulsion, discussion: Parsons, ix 374; Yarrow, ix 381; Thornycroft, ix 381; Swinton, ix 382; Robinson..... ix 382
Apprentice system, machinist, for the Navy..... xiv 222
Appropriation, 1904, new vessels..... xvi 334
Aquila, It., accident to..... vii 605
Aquilon, Fr., des., viii 191; trials..... viii 405
Arabia, mer. str., launch..... ix 197
Aran, Swed., data, xiv 691; trial..... xiv 1269
Arcadia, mer. str., launch..... ix 197
Architecture Navale.—Croneau.—Books received..... vi 844
Arcona, Ger., trials..... xvi 358
Arctic, data..... x 824
Arcturus, yacht, des. vii 856; speed..... viii 213
Ardent, Br., des. and trial, vii 168; coal consumption, vii 423; trial..... xi 328
Arequipa, des..... i 363
Arethusa, steaming radius..... xiii 54
Arethusa, Br., des..... i 171, 264
Aréthuse, Fr., steam pipe explosion..... vi 785
Aretusa, It., launch, iii 283; des..... vi 208
Argentine Navy, Niclausse boiler installations..... xv 1173
Argentine Republic, vessel for..... ii 237
Argonaut, Br., des., viii 827; machinery data, xi 330; trials and experiments, xi 361; trials..... xi 243, 247
Argonaut class Br., data..... xi 242
Argonaute, Fr., trials..... vi 619
Argus, des..... i 356
Argyll, Br., launch and des., xvi 679; combination boilers, Babcock & Wilcox and cylindrical..... xiv 921
Ariadne, Br., des., viii 827; launch and des., x 563; trials..... xi 246, xii 246
Ariadne, Ger., trials..... xiii 782, xiv 333
Ariel, Br., launch, ix 420; comparative data..... ix 35
Ariete, Sp., machinery details..... i 182
Arizona, mer. str., dimensions and data, iv 102; data, vi 162; des..... x 610
Arizonian, mer. str., des..... xiii 310

Arkansas, Act of Congress, x 813; bids, x 1169, launch, xii 1094; trial, xiv 946; des. and contract trial, xiv 1172; comparison of monitor performances.....xv 823
Armand-Bêhic, mer. str., Belleville boilers.....viii 153
Armenia, mer. str., des., viii 648; data.....x 534
Armorclads, modern, first battle between.....x 746
Armor, nickel-steel, trials at Cruesot.....v 1028
Armor plates, annealing, xii 150; electric process.....xii 459
Armor question, 1900.....xii 238
Armor tests.....xi 227
Armored coast defense vessel, *Monterey*, authorization and data.....i 236
Armored Cruiser, Aus., 1898, des.....x 539
Armored Cruiser, *No. 2*, *New York*, authorization and data, i 236; launch, iv 117; des., ii 231; bids.....ii 407
Armored Cruisers, France, *Bouvines*, *Valmy*, *Jemmapes*, des.. ii 235; 2d class, *Charner*, *Bruix*, *Latouche-Treville*, *Chanzy*, des., ii 235; 1892, discussed and compared with British, iv 838; discussion of xvi 700; Japan, 1897, ix 182; two, 14,500 tons, appropriation 1904, *North Carolina*, *Montana*.....xvi 334
Armored cruising monitor, authorization and data.....i 236
Army Journal, English.....xvi 638
Arpad, Aus., des.....xiii 1089
Arrangement and details of construction of marine machinery.....xiv 1
Arrangement and equipment of shipbuilding works.—Dunn.....xiii 947
Arrangement of surface of screw propellers.—Walker.....v 300
Arrogant, Br., des., vii 419, 814; launch and des., viii 617; trials, ix 802; machinery data, xi 330; mentioned with *Vindicative*, viii 170; Bantry to Plymouth, Gibraltar to Plymouth, xii 738; liquid fuel, xiv 308
Arrow, yacht, des.....xiii 321, xiv 1280
Artemisia, mer. str., data.....xiii 537
Artificial draft and its effect on boiler construction.—Lechner.....iii 349
Arun, Br., trials.....xvi 259
Asahi, Jap., des. and trials, xii 571; data.....x 580, xiv 345
Asama, Jap., des.....x 579, x 580, xi 527
Asashio, Jap., launch, xiv 343; trial.....xiv 677
Ash-hoist engines, steam consumption tests, *Minneapolis*.....x 27
Ashlin's high-pressure compound system (for altering old machinery)..viii 157
Askold, Rus., launch, xii 575; data.....xiii 302, xiv 990
Asphalt coatings for iron water pipes.....xi 941
Assam, mer. str., trials.....vi 590
Assaye, Br., launch.....iii 269
Assistant cylinders, see balance cylinders.
Assistant engineers, examination for promotion, Navy Regulation Circular No. 52, i 93; Navy Regulation Circular No. 110, rescinds No. 52..iv 468
Assistants to senior engineer, duties of.....xvi 1172
Astrabad, Rus., data.....xiii 303
Astraea, Br., launch and des., v 518; trials, vi 199; note.....viii 171

Asturia, mer. str., dimensions.....viii 649
Atala, see *Alexander*.
Atbara bridge.....xi 997
Atlanta, authorization and data, i 236; delayed trials, 253; measured-mile trials, 353; propeller data, iv 158, 402; machinery space, i 249; coal endurance, iv 669; test of ice machine, 776; air-pump data, vi 532; data, vii 237; steaming radius.....xiii 54
Atlanta, mer. str., des.....viii 421
Atlantic cargo steamers.....xi 793
Atlantic liner, past, present and future.....iv 99
Atlantic liners, dimensions and data.....iv 102
Atlantic liners, engineer routine.....xvi 886
Atlantic passenger steamers.....xi 905
Atlantic, possibilities of speed on.....v 710
Atlantic record, iii 609; *City of Paris*, iv 494, 792; September, October, November, 1893, v 1019; August, 1894, vi 597, 790; 1898, x 1217; merchant steamers.....iii 609
Atlantic Transport Co.'s steamers.....xiii 309
Atlas, see *Wompatuck*.
Atmah, yacht, launch.....x 937
Atomic weights.....xi 750
Atomizer burners, oil.....xvi 846
Attentive, Br., scout, des.....xvi 985
Audacieux, Fr., launch.....xii 1107
Audaz, Sp., dimensions, ix 192; launch.....ix 438
Augjulli, mer. str., trials.....vi 590
Augusta Victoria, mer. str., des., i 269, viii 862; dimensions and data, iv 102, vi 162
Aurania, mer. str., dimensions and data.....iv 102, vi 162
Aurora, Br., des., i 265, vi 177; defects in machinery.....iv 303
Aurora, Rus., des.....ix 823
Australia, Br., des., i 264; trials, 180; machinery data, viii 568; boiler data.....iv 507
Australia and *Galatea*, Br., des. and trials.....iv 278
Australia, mer. str., launch and des.....iv 863
Australien, mer. str., Belleville boilers, vii 372; Belleville boilers of, compared with cylindrical of *Brésil*.....viii 152
Austria, machine construction.....xi 219
Austria, ship building, program.....x 540
Austrian Navy, Yarrow boilers in, xv 838; water-tube boilers in.....xii 748
Austro-Hungarian torpedo-boat flotilla.....xvi 997
Automatic balance whistle valve.....xi 201
Automatic feed regulator.—Thornycroft.....vi 790
Automatic feed-water regulators, *Maine*, omission recommended.....xv 965
Automatic safety stop valves on the *Texas*.....viii 592
Automatic stokers, aids in boiler testing, x 133; for marine use, xi 67; *Pennsylvania*.....xi 561

Auxiliaries, effect on coal endurance and economical speed, v 66; electric for ships, viii 569; electricity for on German men-of-war, viii 550; mercantile, xiii 607; of fleets, xiii 468, xvi 957; pneumatic, for guns, turrets and rudder, *Terror*, ix 14; advantages of, 27; steam and electric drive compared, xvi 110; installation, xvi 112; reduction of, xvi 114; steam, list of, *Maine*, old, vii 28; *Iowa*.....ix 478
Auxiliary cruisers, Br., *City of New York*, *City of Paris*, i 167; Sp., *Reina Maria Christina*, *Alfonzo XIII*.....i 168
Auxiliary engines, *Brooklyn*, list of.....viii 761
Auxiliary engines in connection with the modern marine engine, abstract.—Allen.....iii 583
Auxiliary machinery, *Columbia*, vi 33; *Diadem*, Br., coal-consumption data, x 434; *Indiana*, vii 662; *Kentucky*, xii 20; *New York*, v 68; *Pennsylvania*, mer. str., xi 562; steam consumption of, xi 566; *Wisconsin*, xii 993; added weight and cost of warships due to, xv 350; coal for, iv 672; main and, steam consumption of, U. S. S. *Minneapolis*, x 1; on shipboard, motors for, cost, weight, space and working expense, iv 194; per cent. of main engine power, *Charleston*, *Philadelphia*, *San Francisco*, *Newark*, *Concord*, *Bennington*, *Yorktown*, iii 217; percentage of total steam, xvi 104; steam consumption of, in warships, Br.....xi 388
Auxiliary naval vessels, merchant steamers for, xiii 607; prices paid for.....x 1161
Auxiliary navy, repair ships.....xiv 1031
Auxiliary vessels, purchased during Spanish war.....x 534
Avant-Garde, Fr., coal consumption, iii 273; comparative data.....ix 35
Averaging instrument.—Coffin's.....v 679
Avon, Br., machinery data, viii 568; launch.....viii 844
Avon, mer. str., des.....x 279, ix 835
Avondale Castle, mer. str., des.....ix 204
Axles and crank pins, nickel-steel for.....x 474

B

B Fleet, Br., fuel economy in maneuvers of 1901.....xiii 1028
Babcock & Wilcox boilers, v 935; *Alert*, test of, xi 285; *Argyle*, Br., xiv 921; *Annapolis*, ix 565; boiler committee's report, xiv 875; British cruisers, xiv 234; British battleships, xiv 237; British report, xvi 920; *Challenger*, coal consumption, xvi 263; circulation shown by model, viii 494; *Cleveland* (*Alert* type), xv 1122; compared with others, xiv 417; *Cornwall*, xvi 684; *Cincinnati*, test, xii 882; *Denver*, xvi 78, 619; *Des Moines*, xvi 232; efficiency test, xiii 223; *Espiègle*, Br., xiii 772; *John W. Gates*, mer. str., xii 899; *Hero*, *Nero* and *Cameo*, mer. strs., viii 770; in navies, xvi 292; interim report of boiler committee, xiii 358; latest type, xvi 1223; *Marietta*, ix 648; xv 59; xvi 1223; *Nebraska*, evaporative test, etc., xvi 133; *Pennsylvania*, mer. str., xi 560; ships fitted with, data, xiv 495; *Tacoma*, xvi 17; test,

April, 1895, vii 694; test with McPhail & Simpson's superheater, viii 365; *West Virginia*, xvi 1223; *Wyoming*, xv 91; *Wyoming*, weight compared with other monitors, xv 576; *Zenith City*, mer. str.....vii 766
Babcock, J. F., Lt., U. S. N.—U. S. Battleship *Ohio*.....xvi 1027
Bacchante, Br., launch and des., xiii 483; trials.....xiv 206
Bach, Prof. C.—Investigation of distortion and resistance of flat heads, x 660
Bache, launch.....xiii 1085
Back tube sheet, elasticity of.....iii 451
Baden, Ger., data compared with triple screw, xiii 404; Dürr boilers, xiii 887, 901, xiv 117; rod pressure xiv 21; cylinder data xiv 37; coal consumption and boiler data, Dürr.....xiv 117
Badger, auxiliary navy, x 535; data.....x 824
Baffling, Dürr, boilers.....xiii 909
Bagasse, as fuel for boiler testing.....x 142
Bagley, torpedo boat *No. 24*, named, x 818; des. and contract trial, xiii 651; fuel data.....xiii 1082
Bailey, F. H., Comdr., U. S. N.—Air pumps, vi 518; discussion, air pumps, vii 136; liquid fuel report.....xvi 719
Bailey, torpedo boat *No. 2*, data, x 818; trials, xiii 472; des., xiii 768; fuel data.....xiii 1082
Bainbridge, destroyer *No. 1*, named, x 817; launch, xiii 769; contract and standardization trial, xiv 1003; full data, xiii 1082; data, xiii 1085; failure of forced-draft blowers.....xiv 296
Baird, G. W., Captain, U. S. N.—Discussion on trials of Commandant's barge, Navy Yard, New York, i 40; duty and capacity tests of high-service pumping engines, Washington, D. C., i 41; Evaporators, i 285; discussion, speed trials of fast ships, ii 89; discussion, tubulous boilers, ii 391; new forms of evaporators, ii 495; discussion, trial trips and the lessons to be learned from them, iii 170; discussion, preservation of marine boilers, iii 438; discussion, electric lighting of ships, iii 517; discussion, effect of auxiliaries on economical speed and coal endurance, v 108; potential and economic efficiency of Davis' foundry coke, under conditions of actual service on board the U. S. steamer *Dolphin*, vi 736; discussion, air pumps, vii 132; experiment to determine the economic vaporization of George's Creek Cumberland coal, under conditions of actual practice on board the *Dolphin* in port, vii 329; test of a No. 4, type B (horizontal) evaporator, viii 95; early steamboats, xi 158; the construction, installation and performance of the electric lighting plant at the Government Hospital for the Insane, Washington, D. C., ix 237; discussion, steam consumption of the *Minneapolis*, x 73; economy of electric lamps, x 404; submarine torpedo boats.....xiv 845
Baker, Chas. H., Chief Engineer, U. S. N.—Obituary.....viii 435
Baker, E. F., Engineer Lieutenant, R. N.—Management of Belleville boilers at sea.....xvi 642
Baker, John Howard, P. A. Engineer, U. S. N.—Obituary.....ii 589
Baku Standard, mer. str., first successful voyage, liquid fuel, vi 417, vii 759
Balance cylinders.—Lovekin, xvi 896; *Kansas*, xvi 905; *Manchuria*, xvi 903; *Texas*, xvi 905; *Washington*.....xvi 905

Balance of a four-cylinder triple-expansion marine engine.—Williams..xiv 121
Balanced sectional drydock.....xiii 443
Balancing engines, the Yarrow-Schlick-Tweedy system of.....x 481
Balancing engines to prevent vibrations.....v 978
Balancing marine engines and vibration of vessels.—Yarrow.....iv 246
Balancing steam turbines.....xiii 140
Ball, B. C.—Indicator diagrams of multiple-expansion engines, xi 46; regarding effect of compression in steam cylinders on economy, xii 764, xiii 104
Ball, Walter, Lieutenant, U. S. N.—Contract trial of the U.S. torpedo-boat destroyers *Lawrence and Macdonough*, xv 667; U. S. S. *Des Moines*, general description, official trial.....xvi 227
Balliste, Fr., trials.....xvi 700, 1011
Ballymena, yacht, data of quadruple-expansion engines..... i 81
Balny, torpedo boat, Fr., comparative data.....ix 35
Baltic, mer. str., des.....xvi 370
Baltimore, authorization and data, i 236; machinery space, i 249; preliminary trials, i 250; des. and contract trial, i 337; patent log on trial, ii 70; second contract trial, ii 122; boiler and engine data, iii 422; deterioration of condenser tubes, iv 114; propeller data, iv 158, 402; coal endurance, iv 663; air-pump data, vi 532; performance and machinery compared with *Iona*, mer. str., vi 685, vii 53; steaming radius.....xiii 54
Bancroft, practice vessel, launch, iv 295 ; trial, v 204; contract trial, v 365; analysis of progressive trial, vi 265; air-pump data, vi 532; run, trans-Atlantic, ix 126; steaming radius.....xiii 54
Bangor, mer. str., launch.....v 1087
Bánki motor.....xii 1067
Banshee, Br., des. and trials, vii 424; note.....vii 821
Banshee, mer. str., des.....vi 840
Barbarossa, mer. str., data, viii 861; des.....ix 830
Barfleur, Br., des., iii 131; launch and des., iv 829; details, v 226; trials, vi 182, 197; size and cost.....vi 495
Barge, steam, progressive trials, Navy Yard, New York.....i 1
Barham, Br., trials, ii 421, v 517, xi 102, xii 246; machinery trial, v 743; overhaul, viii 391; speed.....xi 783
Barnaby, Sidney Walker. Discussion, experiments on the arrangement of the surface of a screw propeller, v 319; discussion, present position of water-tube boilers for marine purposes, v 954; torpedo-boat destroyers, vii 711; on the formation of cavities in water by screw propellers at high speeds, ix 678; discussion, effect of direction of turning of twin-screws, x 492; discussion, logical arrangement of the motive power of warships, xi 681; torpedo-boat destroyers, xiv 396; reply to discussion, 408
Barnaby, Sir Nathaniel.—Discussion, conversions and re-armament of ships.....xiii 624
Barnard, Geo. A.—Obituary.....xii 274
Barney, torpedo boat *No. 25*, named, x 818; trials, xiii 240; speed, xiii 472; des. and contract trial, xiii 651; full data.....xiii 1082

Barr, Professor.—Discussion, determination of the dryness of steam, vii 320; discussion, calculation of power for marine propulsion.....viii 317
Barracouta, Br., des. and trial, ii 232; boiler accident..... 233
Barrosa, Br., trials.....ii 583
Barrow-in-Furness, Naval Construction & Armaments Co., machinery data of vessels.....viii 568
Barrozo, Brazil, launch.....viii 806
Barrus calorimeters, tests.....viii 100
Barry, destroyer *No. 2*, named, x 817; full data, xiii 1082; launch, xiv 613; contract and standardization trial.....xiv 1003
Barry, James Joseph, P. A. Engr., U. S. N.—Obituary.....xiv 711
Bartl, Prof. J.—The selection of the most suitable form of vane for centrifugal pumps.....iii 558
Bartlett, F. W., Lieut. Comdr. U. S. N.—Discussion; experimental station and engineer school, vii 465; the repair ship, a military auxiliary to the naval fleet in peace and war.....xiv 1031
Barton, J. K., P. A. Engr., U. S. N.—The contract trials of the U. S. gunboats *Machias* and *Castine*.....v 846
Basic Bessemer steel, iv 112; use not allowed by Department.....v 196
Basic refined steel on the Continent.....x 685
Basic steel, experiments with.....iv 432
Basilisk, Br., trials.....i 357
Bat, Br., speed, ix 420; trials, ix 806; boiler explosion.....xii 567
Batanga, mer. str., sea voyage performance.....xiii 834
Bath Iron Works, method of molding cylinders in dry sand.....iv 159
Bathurst, Arg. Rep., des. and trial.....iii 142
Batteries, storage, xi 733; for torpedo-boat propulsion.....xi 55
Battery, proposed for new battleships, 1901.....xiii 734
Battery, storage, Edison.....xiii 669
Battle of Santiago.....x 746
Battle of Santiago, before and after.....x 780
Battle of the Yalu and its effect on the construction of warships.—Ferrand.....viii 370
Battleship, alterations, Fr., xi 1109; designs, comparison of xiv 248; 16,000 tons, appropriation, 1904, *New Hampshire*, xvi 334; steam trials.....vi 177
Battleships and cruisers, 1902, plans.....xiv 296
Battleships, argument for, iv 4; 1890, bids, ii 575; Nos. 5 and 6, *Kearsarge* and *Kentucky*, des., vii 581, 801; British, first-class, compared with other navies, xiv 248; coal-consumption and speed curves, xv 366; coal economy on blockade duty, x 1043; docking of, Japanese methods compared with others, xiv 922; maneuvering qnalities of, effect of inturning or out-turning screws, xv 433; *Nelson* class, Br., xvi 998; recent first-class, qualites and performances of, vi 464, vii 538; French, German, Italian, Japanese, Russian and United States, compared with other navies, v 1066, xiv 248; relative power and speed of typical, vi 493; trials.....vi 177

Bayan, Rus., launch, xii 841; des., xii 1115; compared to *Kléber*, xiv 1255; speed.....xiv 1265
Bayern, Ger., speed, xi 255; Dürr boilers, xiii 888, 901, xiv 117; rod pressure, xiv 21; cylinder data, xiv 37; coal-consumption and boiler data.....xiv 117
Bayern, mer. str., reconstruction.....v 1077
Bayley, W. B., Commdr., U. S. N.—The electric pumping plant for the salt-water aquaria, World's Columbian Exposition, Chicago, 1893, iv 203; alloys.....xv 196
Beach, E. L., Asst. Engr., U. S. N.—The accident to the torpedo boat *Ericsson*.....vii 572
Beagle, Br., trials.....i 357
Beare, Prof. T. Hudson.—Discussion, determination of dryness in steam, vii 318
Bearing metals, faults of.....xii 130
Bearings, air-lubricated, ix 267; crank shaft, dimensions, ix 78–82; limits of adjustment on trials, Br., xvi 1288; fitting lignum vitae, *Oregon*, xiv 260; machinery, ix 104; marine engine, quality of oil for, ix 123; of the marine engine, ix 118; position of oil holes for, ix 113; steam turbine, Westinghouse-Parsons, xiii 126; suitable alloys for.....xvi 964
Beatrice, yacht, data.....viii 433
Bedford, Br., des., xiii 1102; trials, xiv 949, 1244; changes in propellers.....xvi 261
Beecher, A. M., Lieut., U. S. N.—Obituary.....xv 1256
Before and after the battle of Santiago.....x 780
Behavior with electric machinery.....x 1156
Belier, Fr., note.....xiv 329
Belleisle, Br., des., i 266; experiment.....xii 830
Belle of Dunkerque, comparison of ordinary and Dickinson propellers..v 314
Bellerophon, Br., training engine-room artificers.....xvi 646
Belleville boiler, the.—Coryell.....ii 371
Belleville boilers, v 941; their applicability to ocean-going vessels, iii 246; *Australien*, mer. str., vii 372; British battleships, xiv 237; British cruisers, xiv 234; circulation shown by model, viii 491; compared with others, xiv 415; comparison of results on *Australien* and *Polynésien* with cylindrical boilers on *Brésil* and *La Plata*, viii 152; defense of.—Reed, xiii 365; des., ii 173; *Diadem* and *Powerful*, compared, x 426; diagram, weight, space, surface, etc., ii 418, 566; disadvantages and defects, boiler committee's report, xiv 868; discussion of British Admiralty report, xvi 497; evaporative trials, vii 791; exhaustive history, xvi 383; experiments for marine machinery, iii 119; *Goodhope*, Br., xv 259; *Hansa*, *Hertha*, Ger., xiv 117; in British Navy, xii 709; in Channel Fleet, full speed trials, xiv 607; interim report of boiler committee, xiii, 358; disadvantages, 360; in various navies, xvi 292, 384, 444; *Kent* and *Lancaster*, Br., xvi 684; land plants, xvi 385; L. Fauveau, xvi 383; management of, at sea, xvi 642; Messageries Maritimes Company's report on, viii 151; *Niobe*, Br., viii 568; non-return valves in down-comers, viii 491; notes on, in service, xii 725; *Ohio*, mer. str., ix 198; packing for tubes, xiv 278; *Powerful*, Br., viii 568, xiv

648, 917; royalties paid for, xiii 456; *Sharpshooter*, Br., vi 414; trials, continued, vi 591; *Shearwater*, ii 484; ships fitted with, data, xiv 495; tests, ii 170, 564; trial data, xvi 452-462; tubes renewed in various ships, Br., xii 739; *Varese*, It., xiv 980; voyage of *Terrible*, xvi 1293; with Ericsson compound engine, ii 445; *Wild Duck*, steam yacht, tests.....vii 79

Belleville, d'Allest and Niclausse boilers, compared in *Bugeaud*, *Chasseloup-Laubat*, *Friant*, Fr.....vii 408

Belleville vs. cylindrical boilers, coal consumption in Messageries Maritime Co.....viii 151

Belleville vs. cylindrical boilers, *Hyacinth*, *Minerva*, Br., trials.....xiv 458

Bellis high-speed, self-lubricating, engines.....ix 699

Bellona, Br., overhaul, viii 391; trials,.....xii 246

Benbow, Br., coal consumption.....xiii 1029, 1031, 1032

Bending tests and contraction of area as proofs of quality of steel.—Kreuzpointner.....iv 764

Benedetto Brin, It., dimensions, x 1202; launch.....xiv 341

Benham, Henry C., Lt., U. S. N.—Obituary.....xvi 717

Benjamin, Charles H.—Power losses in the machine shop.....xii 119

Bennett, F. M., P. A. Engr., U. S. N.—Reconstructed American monitors, ix 525; White patent steam turnabout life launch.....ii 222

Bennington, authorization and data, i 236; test of evaporators, i 291; work on, ii 417; des. and trial, iii 206; power of auxiliary machinery, iii 217; coal consumption, iv 110, xv 366, 379; coal endurance, iv 662; propeller data, iv 158, 402; air-pump data, vi 532; steaming radius.....xiii 54

Bennington, *Yorktown*, *Concord*, trials, results compared.....iii 216

Bent-tube boilers, building of.....xii 25

Beowulf, Ger., repairs, vii 570; coal-consumption and boiler data.....xiv 116

Beresford, Lord Charles, R. N.—Watertight doors and their dangers to modern fighting ships, viii 319; reply to discussion, viii 343; on rotation of propellers.....xvi 121

Bergen, ferry boat, experiments on.....ii 251

Berlin, Ger., progress on.....xvi 357

Berlin, mer. str., boilers, Ellis & Eaves draft.....vi 748

Berlin royal technical high school, mechanical laboratory.....xv 1040

Berryman feed heaters.....iv 398

Berwick, Br., launch and data, xiv 1244; trials .....xiv 1244

Bessemer basic steel, iv 112, v 196; experiments with, effect of riveting, iv 448

Bevington, Martin, Lt. Comdr. U. S. N.—Obituary.....xv 1255

Bevis, R. R.—Discussion, induced draft and hot air, combined, in boilers fitted with "Serve" tubes and retarders.....v 843

Bezuprechni, Rus., launch.....xiv 994

Biddle, named, x 818; des. and contract trial, xiii 651; full data.....xiii 1082

Bieg, F. C., Lt. Comdr., U. S. N.—Data of some quadruple-expansion engines and their performances, i 77; the development of the marine engine in the last decades, translation, i 151; discussion on compressed-air system of forced draft, i 333; discussion on tubulous boilers, ii 380; on the necessity for scientific research in naval engi-

neering * * * and the necessity of an engineer training for the younger members of the engineer corps of the Navy, vii 449; reply to discussion, vii 483; contract and screw trials of the U. S. S. *Katahdin*, viii 1; the contract trials of the U. S. gunboats, *Wheeling* and *Marietta*, ix 641; U. S. battleship *Missouri*, description of vessel, contract trial, xv 1185; text book on naval boilers.....xvi 379
Biles, Prof. J. Harvard.—Discussion, watertight doors, viii 342; discussion, logical arrangement of the motive power of warships, xi 669; discussion, design of a fast scout, xiii 419; discussion, conversions and rearmament of ships, xiii 625; possibilities of speed on the Atlantic.....v 710
Bilge drainage.—Worthington.....iv 92
Bilge drainage of machinery spaces, arrangement.....xiv 13
Bilge keels and rolling experiments on U. S. S. *Oregon*.—Spear.....x 1130
Bilge keels, effect on *Royal Sovereign* class, vii 538; effect on steering and speed, vii 553; influence on rolling and resistance of destroyers, xiii 455; on merchant steamer, x 522; on torpedo boats.....xiii 201
Bilges and compartments, regulations on.....xvi 1202
Billets or tubes.....xii 506
Billings, Wm. R.—Tests of pumping engines and boilers, New Bedford, Mass.....i 299, ii 26
Bismarck, Ger., compared to *Prinz Heinrich*.....xiv 334
Bismuth, relation to fire cracks in brass.....x 1069
Bittern, Br., launch.....ix 421
Bituminous (semi) coal, test in *Cushing*.....iv 36
Black, C. A., mer. str., data.....xi 265
Black Prince, Br., des., i 265; criticism on, xvi 1274; launch and des., xvi 1322; class compared to *Minotaur* class.....xvi 1278
Blackwater, Br., trials.....xvi 259
Blades, steam turbine, Westinghouse-Parsons, securing.....xiii 133
Blair evaporators.....vii 492
Blake, Br., characteristics, iii 142; note on, iii 599; trial and des., iv 121; speed, v 508; Gibraltar to Sierra Leone, vii 736; refit and trials, viii 168; boiler explosion.....viii 614
Blake, high-duty pumping engines, Newton, Mass.—Dean.....v 465
Blake pumping-engine experiments, Newton, Mass., digest of.....v 769
Blakely, torpedo boat *No. 27*, launch, viii 240; full data, viii 1082; named, x 818; trials, xvi 995; des. and contract trials.....xvi 1076
Blanche, Br., defective boilers, ii 234; defects in, iii 131; trials.....xiii 274
Blanco Encalado, Chili, damage by torpedo attack, bids for raising, iv 102; des., vi 602, vii 154; data compared with protected cruisers.....xii 1015
Blast, effect in cupola practice.....x 1058
Blast-furnace gas, power from.....x 1148
Blace-furnace gases, waste, as fuel for boiler testing.....x 138
Blast-furnace practice, American and British.....xii 1077
Blechynden boilers compared with others, xiv 424; destroyers, Br., *Starfish*, vi 365; *Sturgeon* and *Skate*, vii 797; *Sturgeon* class, Br., viii 568; in navies, xvi 292; ships fitted with, data.....xiv 498
Blechynden.—Discussion of papers on water-tube boilers.....viii 510

Blenheim, Br., launch, ii 419; trials, iv 306, 831; characteristics, iii 142; performance data, v 504; correction of trial data, v 508; Stockholm to Sheerness.....xii 736
Blomberg, C. A.—Experiments with Belleville boilers for marine machinery.....iii 119
Blower engines, forced draft, steam-consumption tests, *Minneapolis*, x 27; ventilating, steam-consumption tests, *Minneapolis*.....x 51
Blower fans, centrifugal, design and test.....ix 293
Blowers, fan.—Dowst.....iii 473
Blowers, auxiliary engines, etc.....iii 584
Blowers, comparison of mechanical drafts.....viii 140
Blowers, forced-draft service, defects, xiv 8; relation of power and revolutions.....iv 680
Blowing fan, investigation of.....xi 186
Blowing fans, methods of testing.....xii 157
Blue-printing processes, rapid.....xi 460
Boa, Aus., speed.....x 1177
Boadicea, mer. str., launch and des.....x 277
Boards on changes, status of, under contracts for new navy.....x 374
Boats, steam, of *Infanta Maria Teresa*.....vi 624
Bogatyr, Rus., des., xiii 303, 511, xiv 991; trials, xiv 682, 994; battery..xiii 791
Boiler and pipe material, advances in manufacture.....xi 1
Boiler, Belleville, the.—Coryell.....ii 371
Boiler circulation, Yarrow's tests on.....viii 133
Boiler committee, Admiralty, report, v 586; interim report, xiii 353; second report on the trials of the *Minerva* and *Hyacinth*, Br., xiv 458; report.....xiv 866
Boiler committee's report, comment on.....xvi 932
Boiler compounds, question of.....xii 441
Boiler construction, effect of forced draft, artificial.....iii 349
Boiler construction, special steel for.....x 203
Boiler coverings.....x 708
Boiler data.
Alabama, xii 873; *Albany*, xii 302; *Albatross*, vi 505; *Alert*, Babcock & Wilcox, xi 290; *Annapolis*, ix 566; *Arkansas*, Thornycroft, *Daring* type, xiv 1182; *Australia*, Br., iv 507, viii 568; *Avon*, Br.....viii 568
Babcock & Wilcox boiler tested April, 1895, vii 698; *Bagley*, Normand, xiii 1082; *Bailey*, Seabury, xiii 1082; *Bainbridge*, Thornycroft, xiii 1082; *Bainbridge*, Thornycroft, *Daring* type, xiv 1014; *Baltimore*, i 341, iii 422; *Bancroft*, v 374; *Barney*, Normand, xiii 1082; *Barry*, Thornycroft, xiii 1082, xiv 1014; Belleville boiler with Ericsson engine, ii 467; *Bennington*, see *Concord; Bergen*, ferry boat, ii 263; *Biddle*, Normand, xiii 1082; *Bittern*, Br., viii 568; *Blakely*, Normand, xiii 1082, xvi 1084; blank form for boiler-trial report, xii 52; *Boston*, iii 422; *Brooklyn*.....viii 754
Campania, mer. str., v 395; *Castine*, v 859; *Charleston*, iii 422; *Charleston* (old), i 316; *Chauncey*, Thornycroft, *Daring* type, xiii 1082; xiv 1014; *Chicago*, iii 422; *Cincinnati*, Babcock & Wilcox,

Boiler data.
xii 882; *Cleveland*, Babcock & Wilcox, xv 1122; *Colorado*, Niclausse, xvi 1133; *Columbia*, vi 23; commandant's barge, Navy Yard, New York, i 28; *Concord*, iii 93, 422; *Conqueror*, Br., iv 507; Corliss, New Bedford, Mass., i 301 *Craven*, Normand, xiii 1082; *Cushing*, Thornycroft, ii 218, iv 14, xiii 1082; Cylindrical and water-tube boilers for passenger steamer of 10,000 H. P.....ix 674
Dahlgren, Normand, xiii 1082; *Dale*, Thornycroft, *Daring* type, xiii 1082; *Davis*, Thornycroft, xiii 1082; *Decatur*, Thornycroft, *Daring* type, xiii 1082, xiv 65; *De Long*, Normand, xiii 1082, xiv 833; *Denver*, Babcock & Wilcox, xvi 78; *Des Moines*, Babcock & Wilcox, xvi 232; *Dolphin*, iii 422, vi 737, vii 329; *Dupont*, modified Normand.....xiii 1082
Edgar, Br., viii 568; *Empress of China*, mer. str., viii 568; *Empress of India*, mer. str., viii 568; *Empress of Japan*, mer. str., viii 568; *Ericsson*, Thornycroft.....xiii 1082
Farragut, Thornycroft, xiii 1082; *Flora*, Br., viii 568; *Florida*, Mosher, xv 563; *Foote*, Mosher, xiii 1082, ix 664; *Fox*, Thornycroft.....xiii 1082
Galetea, Br., iv 507; *Gibraltar*, Br., v 737; *Goldsborough*, Thornycroft, xiii 1082; *Gresham*, ix 262; *Gwin*, Normand.....x 500, xiii 1082
Helena, ix 368; Hohenstein boiler tests, xvi 740; *Hopkins*, Thornycroft, *Daring* type, xiii 1082, xv 707; *Hudson*, v 707; *Hull*, Thornycroft, *Daring* type.....xiii 1082, xv 707
Illinois, xiii 573; *Indiana*, vii 650; *Iona*, mer. str., iii 376; *Iowa*, ix 467; *Iroquois*, mer. str.....vi 448
Jason, Br., viii 568; *John W. Gates*, mer. str., Babcock & Wilcox, xii 899; *Juno*, Br.....viii 568
Kalahdin, viii 12; *Kearsarge*, xi 838; *Kentucky*, xii 12; *Korea*, mer. str.....xiv 387
Latona, Br., viii 568; *Lawrence*, modified Normand.....xiii 1082, xv 677
Macdonough, modified Normand, xiii 1082; xv 677; *Machias*, v 859; *Mackensie*, Thornycroft, xiii 1082; *Magicienne*, Br., iv 507; *Maine* (old), vii 14; *Maine*, Niclausse, xiv 1135; *Majestic*, Br., viii 568; *Manning*, ix 720; *Marathon*, Br., iv 507; *Marblehead*, vi 139; *Marietta*, Babcock & Wilcox, ix 650; *Massachusetts*, viii 251; *McCulloch*, ix 720; *McKee*, Thornycroft, xiii 1082; *Medea*, Br., iv 507; *Medusa*, Br., iv 507; *Meteor*, mer. str., i 228; *Minneapolis*, vi 723; *Missouri*, Thornycroft xv 1202; *Mongolia*, mer. str., xvi 240; *Monterey*, Ward and cylindrical, ii 414; v 128; *Morris*, Normand....xiii 1082
Nashville, Yarrow type and cylindrical, ix 585; *Nevada*, Niclausse, xv 105; *Newark*, iii 108, 422; *Newport*, ix 555; *New York*, v 625; *Nicholson*, Mosher, xiii 1082; Niclausse, safety, water-tube, x 111, xvi 1061; Niclausse test boilers, xi 881; *Niobe*, Br.....viii 568
O'Brien, Mosher, xiii 1082; *Ohio*, Thornycroft, xvi 1049; *Olympia*, vi 250; *Oneonta*, yacht, Thornycroft, x 399; ordinary tubes compared with "Serve," ii 570; *Oregon*.....viii 455
Parthenia, yacht, Almy, x 397; *Paul Jones*, Thornycroft, xiii 1082, xiv 787; *Pelorus*, Br., viii 568; *Pennsylvania*, mer. str., Babcock &

Boiler data.
Wilcox, xi 560; *Perry*, Thornycroft, xiii 1082, xiv 787; *Petrel*, iii 422; *Philadelphia*, ii 529, iii 422; *Porter*, modified Normand, xiii 1082; *Powerful*, Br., viii 568; *Preble*, Thornycroft.....xiii 1082, xiv 787
Ramillies, Br..v 740; *Rodgers*, Mosher, xiii 1082; *Rowan*, Mosher..xiii 1082
San Francisco, ii 544, iii 422; *Shubrick*, Thornycroft, xiii 596, 1082; *Somers*, xiii 1082; steam cutters, U. S. Navy, xiv 44; *Stewart*, Seabury, xiii 1082, xv 114; *Stringham*, Thornycroft, xiii 1082; *Stockton*, Thornycroft, xiii 1082; *Sturgeon* class, Br.....viii 568
Talbot, torpedo boat, Normand, x 500, xiii 1082; *Tacoma*, Babcock & Wilcox, xvi 17; *Terror*, ix 15; *Texas*, viii 89; *Thornton*, Thornycroft, xiii 596, 1082; *Tingey*, Thornycroft, xiii 1082, xvi 59; *Truxtun*, Thornycroft, *Speedy* type, xiii 1082, xiv 1090; Turkish torpedo boats, ii 115; typical ocean steamers (forty).....vi 162
Variag, Rus., Niclausse, xii 1012; *Vesuvius*, iii 422; *Vicksburg*, ix 555; *Victory*, mer. str., vii 766; *Ville de Douvres*, mer. str., iv 412, 545; *Vulcan*, Br.....iv 507
Wacouta, yacht, xiv 1161; *Wheeling*, Howden system of draft, ix 647; *Whipple*, Thornycroft *Speedy* type, xiii 1082, xiv 1090; *Wild Duck*, yacht, vii 82; *Wilkes*, Seabury, xiii 1082; *Wilmington*, ix 363; *Winifred*, mer. str., x 989; *Winslow*, Mosher, xiii 1082; *Wisconsin*, xii, 987; *Worden*, Thornycroft, *Speedy* type, xiii 1082, xiv 1090; *Wyoming*, Babcock & Wilcox.....xv 91
Yorktown, i 141, iii 422; *Yosemite*, yacht.....vii 672
Zenith City, mer. str.....vii 766
Boiler deposits.....iii 243
Boiler design, influence on, of coal carried.....xvi 161
Boiler explosions, vii 64; on the French torpedo boat *Sarrasin*, vi 166; on the torpedo boat *Adler*, Aus., 1899.....xii 197
Boiler feed water, rapid analysis of scale ingredients.....x 1117
Boiler fittings, red-hot furnace-crown, experiments.....iii 224
Boiler furnaces, advantages of mechanical draft over chimneys, xi 222; factors of safety, v 30; gauging the circularity of, x 1074; marine, v 11; requirements.....v 15
Boiler installation, cylindrical and water-tube, for 10,000-H.P. passenger steamer.....ix 674
Boiler joints, riveted, tests at Watertown Arsenal.....iv 624
Boiler laws of U. S. steamboat-inspection service, revision of.....xv 382
Boiler, naval, question in France.....xv 449
Boiler problem, naval.....xv 207
Boiler rating and smoke prevention.....xi 983
Boiler rivets, standard dimensions.....iii 421
Boiler scale.....iv 685
Boiler shop and plant at the Union Iron Works, California.—Smith.....ii 139
Boiler-shop practice.—Engard.....ii 129
Boiler systems, combination.....xiv 920
Boiler testing with various fuels, methods for best results.—Jones, x 129; discussion: McFarland, 147; Platt, 148; Meier..... 148

Boiler tests, form for report of.....x 147
Boiler treatment, rules for.....iv 696
Boiler trials, code of 1899.....xii 37
Boiler tubes, Admiralty test for, viii 814; cold drawn, for naval purposes, xv 421; corrosion of, xiv 510; xvi 529; corrosion of in U. S. Navy, xii 587, 907; xiii 333, 822; damage by tube cleaners, xvi 1280; effect of angle of on evaporation, viii 481; experiments, Yarrow, xiv 535; ferruled, success of in British Navy, iv 837; for locomotives, 20-foot, xii 1050; hot and cold treatments, xv 422; iron vs. steel, iv 488; leaky, iv 507; manufacture and inspection, ii 301; nickel-steel, xvi 328; nickel-steel and mild steel, xi 633; nickel-steel, for naval purposes, xv 420; ordinary compared with "Serve," ii 569; overheating due to roll of ship, viii 487; seamless steel, xv 431; seamless steel, limited endurance, xv 417; Serve's, iv 288; vi 745; Serve's ribbed.—Willets, iii 345; solid drawn, x 1102; steel, reasons for rapid corrosion of, vii 413; steel, to replace copper nearest fire in British destroyers, vii 424; tests of.....ix 127
Boiler-tube tests in German Navy.....xi 492
Boiler-water gauge, new form of.....x 777
Boiler weights, see Weights, boiler and Boilers, weights.
Boilers.
Advantages of large furnaces and combustion chambers.....viii 766
Alert, performance data.....xvi 153, 163
And their deterioration.....iv 684
Anderson & Lyall's compound.....vi 360, viii 479
Almy: *Alcedo*, yacht, viii 854; *Anita*, yacht, viii 213; *Arcturus*, yacht, vii 856; *Calypso*, yacht, vii 631; *Free Lance*, yacht, vii 628; *Giralda*, yacht, viii 432; *Illawara*, yacht, viii 215; *Parthenia*, yacht, vii 661, x 397; *Perigrine*, yacht, vii 630; evaporative test, ix 135; *Arkansas*, *Nevada*, *Wyoming*, *Florida*, compared.....xv 576
Arrangements (two) of tubes in tube sheet.....v 333
Babcock & Wilcox: *Alert*, test of, xi 285; *Annapolis*, ix 565; *Argyll*, Br., xiv 921; Boiler Committee report, xiv 875; British battleships, xiv 237; British cruisers, xiv 234; British report on, xvi 920; *Cameo*, mer. str., viii 770; *Challenger*, coal consumption, xvi 263; *Chicago*, viii 383; *Cincinnati*, test, xii 882; circulation shown by model, viii 494; *Cleveland*, *Alert* type, xv 1122; compared with others, xiv 417; *Cornwall*, xvi 684; *Denver*, xvi 78, 619; *Des Moines*, xvi 232; efficiency test, xiii 223; *Espiégle*, Br., xiii 772; *Grand Duchess*, mer. str., viii 207; *Hero*, mer. str., vii 619, viii 769; in navies, xvi 292; interim report of Boiler Committee, xiii 358; *John W. Gates*, mer. str., xii 899; latest type, xvi 1223; *Marietta*, ix 648, xv 59, xvi 1223; *Nebraska*, evaporative test, etc., xvi 133; *Nero*, mer. str., v 935, vi 395, viii 769; *Pennsylvania*, mer. str., xi 559; *Queen City*, mer. str., viii 208, 652; *Scottish Hero*, mer. str., vii 852; ships fitted with, data, xiv 495; *Sovereign*, yacht, viii 660; *Tacoma*, xvi 17; test, April, 1895, vii 694; *Turret Cape*, mer. str., viii 620; *West Virginia*, xvi, 1223; *Wyoming*, xv 91; *Wyoming*, weight compared with other monitors, xv 576; yacht, viii 434; *Zenith City*, mer. str.....vii 621, 766

Boilers.
Barham and *Bellona*, Br., bad arrangement of tubes in tube sheets...v 333
Barracouta, Br., accident to.....ii 233
Belleville: v 941, vii 372; *Andromeda*, Br., vii 813; *Armand Béhia*, mer. str., vi 380; *Bremus*, Fr., viii 187; British battleships, xiv 237; British cruisers, vii 418, xiv 234; *Buda-Pesth*, Aus., vii 811; channel fleet full-speed trials, xiv 607; circulation shown by model, viii 491; compared with others, xiv 415; cruiser *K*, Ger., viii 553; defense of.—Reed, xiii 365; des., ii 173; des. and management, vii 365; *Diadem* and *Powerful* compared, x 426; diagram, weight, space, surfaces, etc., ii 418; disadvantages and defects, boiler committee's report, xiv 868; discussion of British Admiralty report, xvi 497; exhaustive history, xvi 383; evaporative trials, vii 791; experiments with marine machinery, iii 119; *Good Hope*, Br., xv 259; *Hansa*, *Hertha*, Ger., xiv 117; in British Navy, xii 709; in French Navy v. 933; interim report of boiler committee, disadvantages, xiii 358; in various navies, xvi 292, 384, 444; *Kent* and *Lancaster*, Br., xvi 684; *Kherson*, Rus., vi 618, 791; land plants, 385; L. Fauveau, xvi 383; management of at sea, xvi 642; *Niobe*, Br., viii 568; non-return valves in downcomers, viii 491; notes on in service, xii 725; *Ohio*, mer. str., vii 619, ix 198; packing for tubes, xiv 278; *Pascal*, Fr., viii 189; *Polynesien*, mer. str., vi 380, 395; *Powerful*, Br., viii 568, xiv 648, 917; *Powerful* Br., evaporative test and method of firing, viii 822, 825; *Powerful* and *Terrible*, Br., vi 197; royalties paid for, xiii 456; *Sharpshooter*, Br., v 1031, vi 202, 407, 414, vii 901, viii 379; trials continued, vi 591; *Shearwater*, ii 484; ships fitted with, data, xiv 495; *Terrible*, Br., vii 592; tests, ii 564; *Thames*, mer. str., vi 636; their applicability to ocean-going vessels, iii 246; trial data, xvi 452, 462; tubes renewed in various ships, Br., xii 739; *Varese*, It., xiv 980; *Vindictive*, Br., viii 170; voyage of *Terrible*, xvi 293; *Wild Duck*, yacht, vii 79; with *Ericsson* compound engine, ii 445; and cylindrical; Massageries Maritimes Company's report on.....viii 151
Belleville, D'Allest, Niclausse, compared in *Bugeaud*, *Chasseloup-Laubat* and *Friant*, Fr.....vii 408
Bent-tube, building of.....xii 25
Blanche, Br., defects in.....ii 234
Blechynden: vi 365; *Scud*, yacht, viii 662, 874; *Starfish*, Br., vii 818; *Sturgeon* class, Br., viii 568; compared with others, xiv 424; ships fitted with, data.....xiv 498
Brandenburg, Ger., accident.....vi 416
Bureau Steam Engineering design, torpedo boat *No. 3*.....viii 799
Butt straps, formulae for.....iv 403
Charleston, defects developed, chase of *Ilata*.....iv 364
Cincinnati, performance data.....xvi 153, 163
Combined cylindrical and water-tube, ships fitted with.....xiv 508
Comparison, Babcock & Wilcox, *Zenith City*, and cylindrical, *Victory*, vii 766
Comparison of Belleville on *Australien* and *Polynésien* with cylindrical on *Brésil* and *La Plata*.....viii 152

Boilers.
Comparison of different types.....vii 121
Construction of, adapted to forced draft.....iii 229
Corliss: tests of.....i 299
Corrosion and pitting.....iv 689
Corrosion by magnesium chloride.....xiv 1214
Corrosion, external and internal.....v 574
Corrosion of tubes, etc., British report.....xvi 928
Cost of water-tube, for French Navy.....vii 408
Cushing, *Newark* and *Tripoli*, Fr., compared.....vi 378
Cushing, zincs in, iv 44; performance data.....xvi 153, 163
Cylindrical, advantages of.....viii 477
Cylindrical and water-tube compared.....vi 373
Cylindrical and water-tube compared, *Minerva* and *Highflyer*.....xii 711
Cylindrical, factors of safety for.....vii 794
Cylindrical, formulae for strength of seams, stays and braces.....viii 269
D'Allest, Belleville and Niclausse, compared in *Chasseloup-Laubat*, *Bugeaud*, *Friant*, Fr., vii 40; *Bouvines*, Fr., vii 402, 604; old and new types.....vii 388
D'Allest: iv 103; tests.....vi 368
Damage by tube cleaners.....xvi 1280
Damage from forcing, British report.....xvi 929
Defective, in English war vessels.....iv 103
Defects in *Iphegenia*, Br.....iv 837
Defects in service.....xiv 6
Defects in *Vulcan*, Br.....iv 118
Development of cylindrical heads for.....iii 221
Diadem, Br.....xvi 921
Dürr: vi 361; advantages and disadvantages, xiii 923; *Baden*, Ger., xiii 887, 901, xiv 117; Baffling, xiii 909; *Bayern*, Ger., xiii 888, 901, xiv 117; boiler committee report, xiv 875, xvi 920; British cruisers, xiv 234; compared with others, xiv 418; cruiser *B*, Ger., xiii 895; cruiser *L*, Ger., viii 553; *Encounter*, Br., xiv 921; experimental, Kiel, xiii 885, 901; German Navy, xiii 881; interim report of boiler committee, xiii 358; *Medusa*, Br., xiv 643; *Prinz Heinrich*, Ger., xiii 895, 901; *Rheim*, Ger., xiii 881; *Roxburgh*, Br., xiv 921; *Sachsen*, Ger., xiii 901, xiv 117; ships fitted with, data, xiv 498; *Victoria Louise*, Ger., xiii 891, xiv 117; *Vineta*, Ger.....xiii 895, 901, xiv 117, 216
Du Temple: v 946; *Spanker*, Br., vii 821, viii 392, 835; notes on, for torpedo boats, tests.....viii 786
Du Temple-Guyot: *Jurien de la Gravière*, Fr., xiv 669; *Jules Michelet*, xvi 352; tests.....ix 772
Effect of forced draft, artificial, on construction.....iii 349
Efficiencies, curves.....xvi 165
Ellis & Eaves draft system.....vi 744
English, naval, particulars.....iv 506
Espiègle, Br.....xvi 920
Failure of, in British Navy.....iv 496

Boilers.
Fantôme, Br.....xvi 920
Ferrules for tubes.....v 328, 489
Fleming and Ferguson, vi 358; *Aberdeen*, mer. str.....vi 642; vii 444
For British Navy.....xiv 239
For new British warships.....xiv 234
Forced draft, combustion chambers and tube sheets for.....iv 787
Fore River: *Lawrence*, xiii 1082; *Macdonough*.....xiii 1082
Fox's corrugated furnaces, formulae.....iv 257
France, merits of large and small-tube, for cruisers and battleships..xv 449
French, for a British vessel.....v 1031
French, order concerning selection.....xv 452
Gleaner, Br., accident to.....iv 305
Guyot-DuTemple: compared with others, xiv 425; ships fitted with..xiv 500
Hermes, Br.....xvi 929
Hermione, Br., evaporative test.....vii 151
Herreshoff, description.....ii 175
High funnels, advantages for complete combustion.....viii 768
Hyacinth, Br.....xvi 919, 515
Hohenstein: compared with other straight-tube type, xv 228; des., xv 213; performance data, xvi 153, 163; report of board.....xvi 719
Inchdune and *Ichmarlo*, mer. strs.,.....xiii 151
Induced draft and hot air, combined, in boilers fitted with "Serve" tubes and retarders.....v 828
Interchangeability of units.....xii 106
Janson, water-tube, description.....xiv 1192
Lagrafel-D'Allest: v 938; vii 368; *Bovines*, Fr., test, vii 402; *Carnot*, Fr., vii 385; *Chasseloup-Laubat*, Fr., cost, vii 408; compared with others, xiv 424; des. and management, vii 365, 402; *D'Estrees*, Fr., viii 190; *Du Chayla*, Fr., viii 188; *Infernet* and *K3*, Fr., viii 190; *Jaurèguiberry*, Fr., des., trials and accident, vi 617, viii 624; *Masséna*, Fr., vii 603; ships fitted with, data.....xiv 500; test, v 949
Laird: compared with others, xiv 426; ships fitted with, data.....xiv 500
Laird-Normand: *Topaze* and *Diamond*, Br.....xvi 1246
Lecture.—McFarland.....vi 659
Life of.....v 585
Locomotive: loss of heat, xi 493; of *Salamander*, Br., to be replaced by water-tube, viii 620; of *Satellit*, Aus., compared with *Speedy*, Br., vi 394; weight of.....vi 350
Locomotive, Purdue tests.....xiii 70
Lyall.....vi 360
Magicienne, Br., defects in.....iv 279
Marathon, Br., defects in.....iv 279
Marine: vi 659; care of, v 574; compound, viii 477; construction, v 890; defects of, in British Navy, discussed and remedies suggested, v 327; efficiency of combustion and higher steam pressures, viii 764; factors of safety, vii 794; methods of introducing feed water.....v 984
Mayabara, water-tube.....x 1146

Boilers.
Mechanical construction.....iv 701
Medea, Br., defects.....iv 279
Medusa, Br., xvi 336; defects in.....iv 279
Minerva, Br.....xvi 919, 515
Mosher: compared with others, xiv 424; *Feiseen*, yacht, v 763 ; *Foote*, ix 662, xiii 1082; *Florida*, xv 563; weight compared with other monitors, xv 576; *Nicholson*, xiii 1082; *O'Brien*, xiii 1082; *Rodgers*, xiii 1082; *Rowan*, xiii 1082; *Tarantula* (new), xvi 1341; *Winslow* xiii, 1082; yacht.....viii 874
Naval: report of British committee on, xiv 866, xvi 918; text-book on..xvi 379
Navy.....iv 273
Nebraska, performance data.....xvi 153, 163
New type of ferrules in the British Navy.....v 715
Niclausse: vi 364, vii 402; advantages, xv 1167; baffling, xvi 156; boiler committee report, xiv 875; British report on, xvi 920; British cruisers, xiv 234; *Carnarvon*, Br., xiv 921; circulation shown by model, viii 495; compared with others, xiv 416; *Colorado*, xvi 1133; *Cristobal Colon*, Sp., viii 854; defense of, xiv 485; description, xv 1163; des. and management, vii 365, 402; details of construction, xiii 377; *Devonshire*, Br., xiv 921; *Freya*, Ger., viii 553; xvi 117; *Halcyon* class, Br., vii 803; *Friant*, Fr., des., cost and trials, vii 172, 408; viii 375; *Garibaldi*, It., xiv 980; *Gazelle*, Ger., xiv 117; in Argentine Navy, xv 1173; in British Navy, xv 1172; in Chilian Navy, xv 1173; in French Navy, xv 1172; in German Navy, xv 1173; in Italian Navy, xv 1172; in Japanese Navy, xv 1173; in Portuguese Navy, xv 1173; in Russian Navy, xv 1172; in Spanish Navy, xv 1172; in Turkish Navy, xv 1173; in United States Navy, xv 1173; interim report of boiler committee, xiii 358; *Jean Bart*, Fr., xiv 325; *Maine*, xiv 1133, xv 951; *Minnesota* and *Dakota*, mer. strs., xv 1163; *Nevada* xv 105; weight compared with other monitors, xv 576; *Seagull*, Br., viii 172; ships fitted with, data, xiv 500; *Suffren*, Fr., x 1202; xvi 699; test at Cramp's, xi 881; test under forced draft, xvi 1060; trial data, various vessels.....xv 1171
Niclausse, Belleville, D'Allest, compared in *Friant*, *Bugeaud*, *Chasseloup-Laubat*.....vii 408
Normand: iv 491, v 946; *Aquilon*, Fr., viii 191; *Bagley*, xiii 1082; *Bagley*, *Barney*, *Biddle*, xiii 653; *Banshee*, *Contest*, *Dragon*, Br., vii 424; *Barney*, xiii 1082; *Biddle*, xiii 1082; *Blakely*, xiii 1082; characteristics of, xv 1065; compared with others, xiv 421; *Craven*, xiii 1082; *Dahlgren*, xiii 1082; *De Long*, xiii 1082, xiv 833; *Dunois*, *La Hire*, Fr., viii 190; *Dupont*, xiii 1082; efficiency, xvi 159; *Gwin*, x 500, xiii 1082; *Lawrence* and *Macdonough*, modified Normand, xv 677; *Morris*, xiii 1082; *Pelorus*, Br., vii 601; *Porter*, xiii 1082; *Rocket*, *Shark*, *Surley*, Br., vii 423, viii 177, 179; *Rocket*, Br., to have steel tubes, viii 621; ships fitted with, data, xiv 502; *Talbot*, x 500, xiii 1082; Torpedo boat *No. 149*, Fr.....iv 491
Normand-Sigaudy : xv 1074; *Chateaurenault*, *Jeanne d'Arc*, *La Hire*,

Boilers.
Fr., xii 569; *Depuy de Lôme*, xvi 350; *Montcalm*, Fr., xiv 968; ships fitted with, data....xiv 502
Of war vessels....xi 741
Oriolle: v 940; ships fitted with....xiv 504
Overheating in the fire surfaces of....ii 201
Power of, compared, in U. S. and British ships....viii 30
Preservation of marine....iii 179
Preservation when not in use....iv 800
Pressures permissible, steamboat-inspection rule....iv 219
Proportionate power in fast ocean steamships....v 826
Proportions of, for power developed....vii 784
Purves furnaces....vi 745
Reed: *Janus*, *Lightening*, *Porcupine*, Br., viii 839; compared with others, xiv 426; ships fitted with, data, xiv 502; *Sapphire*, Br....xvi 1246
Regulations on....xvi 1204
Report of Admiralty boiler committee....v 586, xiii 353, xiv 458, 866
Revision of laws of steamboat inspection service....xv 382
Riveted joints, formulae for, iv 403; riveted joints, formulae for strength of....viii 269
Roberts: *General Nerino*, U. S. of Col....viii 202
Rules for treatment of....iv 696
Saxonia, mer. str....xvi 919
Schichau: ships fitted with, data....xiv 504
Schultz: compared with others, xiv 421; ships fitted with, data, xiv 504; *Nymphe-Wurttemberg*, Ger....xiv 117
Scotch: diagram, ii 418; use of retarders....viii 777
Seabury: *Bailey*, xiii 1082; *Beatrice*, *Kanawha*, yachts viii 433; *Hiawatha*, yacht, viii 214; *Huntress*, yacht, vii 630; *Stewart*, xiii 1082, xv 114; *Wilkes*, xiii 1082; *Willa-Walla*, yacht....viii 661
Seagull, Br....xvi 920
Seaton: vi 363; second-hand purchase of....xi 195
Selection for best results....xvi 162
Serpollet, and superheating steam....iii 588
Sheldrake, Br....xvi 920
Sindh, mer. str., service of....iii 253
Stationary, powdered coal in....xiii 174
Steam, development of cylindrical heads for....iii 221
Steam, care of....x 768
Steamboat inspection rules....iv 214
Strength of....xi 748
Suction draft for....vi 744
Superheaters, various types....viii 351
Tacoma....xvi 17
Thermal efficiency, British report....xvi 922
Thin tube sheets advocated....v 330
Thornycroft: v 945; *Aegir*, Ger., vii 604, viii 553; *Ariete*, Sp., i 182; *Arkansas*, *Daring* type, xiv 1182; weight, compared with other

Boilers.
monitors, xv 576; *Aegir*, *Luchs*, *Iltis*, *Niobe*, *Jaguar*, *Tiger*, Ger., xiv 117; *Avon* and *Bittern*, Br., viii 568; *Bainbridge*, xiii 1082; *Bainbridge*, *Barry*, *Chauncey*, *Daring* type, xiv 1012; *Barham*, *Bellona*, Br., viii 391; *Barry*, xiii 1082; *Chauncey*, xiii 1082; circulation in, vi 349; circulation shown by model, viii 494; compared with others, xiv 420; *Cushing*, ii 580, iv 14, xiii 1082; compared with Ward boiler, ii 581; comparison of weight with locomotive type, vi 350; *Dale*, xiii 1082; *Daring*, Br., weight, vii 725; *Daring* type (new), vi 156; building of, xii 25; *Davis*, xiii 1082; *Decatur*, *Daring* type, xiii 1082, xiv 64; des., ii 176; diagrams, ii 418; *Ericsson*, viii 1082; *Farragut*, xiii 1082; feed-regulator, x 518; *Fox*, xiii 1082; *Geiser*, Den., v 163; *Goldsborough*, xiii 1082; *Hopkins*, xiii 1082; *Hopkins* and *Hull*, *Daring* type, xv 706; *Hull*, xiii 1082; hydraulic life-boat *Queen*, fitted for oil fuel, x 389; *Mackenzie*, xiii 1082; *McKee*, xiii 1082; *Missouri*, xv 1200; *Natter*, Ger., viii 806; *Ohio*, xvi 1050; *Oneonta*, yacht, vii 630, x 399; *Paul Jones*, xiii 1082; *Paul Jones*, *Perry*, *Preble*, xiv 786; *Perry*, xiii 1082; *Pelorus*, Br., viii 568; *Preble*, xiii 1082; *Proserpine*, Br., vii 815; *Satellit*, Aus., locomotive, compared with *Speedy*, Br., vi 394; *Shubrick* and *Thornton*, xiii 596; *Stringham*, xiii 1082; ships fitted with, data, xiv 504; tests of a model, vii 730; *Thornton*, xiii 1082; *Tingey*, xiii 1082, xvi 59; *Truxtun*, xiii 1082; *Truxtun*, *Whipple*, *Worden*, *Speedy* type, xiv 1090, xv 396; torpedo boat, xvi 154; *Shubrick*, xiii 1082; *Stockton*, xiii 1082; water-tube, circulation in, vi 349; *Whipple*, xiii 1082; *Worden*.....xiii 1082
Thunderer, Br., defects in.....iv 280
Timing indicators for firing furnaces.....xvi 1291
Towne: des., ii 177; *Windom*, v 988; for small installations.....xiv 426
Transmission of heat through tube plates.....v 436
Tube ferrules, *Thunderer*, Br., *Vulcan*, Br., *Devastation*, Br.....v 449
Tubulous: iv 708; in French Navy, vii 365; requisites.....ii 163, 166
Types for high-pressure at sea.....x 1079
Used in German men-of-war.....viii 553
Various navies.....xvi 290
Volatile oils in.....xi 462
Vulcan, Br., defects in.....iv 280
Ward: compared with others, xiv 425; compared with Thornycroft, ii 581; des., ii 177; diagram, ii 418; *Monterey*, des., v 127; sizes for steam cutters, U. S. Navy.....xiv 37, 44
Warrington: yacht.....viii 212
Water for.....xi 225
Water-tube.....iv 708, x 627, xiv 244
Water-tube.—Milton.....v 931, vi 357
Water-tube.—Soliani.....vii 97
Water-tube.—Watt.....viii 481
Water-tube: Advantages, v 932; advantages and disadvantages, vi 662, xv 945; advantages over cylindrical, xiii 358; air admitted over grates of, x 635; Austrian Navy.....xiv 246

Boilers.
Babcock & Wilcox compared with Belleville, Wilson Sons & Co.'s steamers, viii 770; baffling required for efficient combustion, viii 771; British battleships and cruisers, xiv 234; building of, xii 25; care of in British Navy.....x 523
Circulation shown by models, Belleville, Yarrow, Thornycroft, Babcock & Wilcox, Niclausse, experimental, viii 489; combustion spaces and their arrangement, x 727; compared with cylindrical for marine purposes, xiv 409; corrosion.....vii 116, x 627
Diameters of tubes, x 108; downcomers, heated or non-heated, viii 497; durability of, xi 633; Dutch Navy.....xiv 246
Effect of circulation on evaporation, xii 194; efficiency of, xi 994; efficiency of, formulae for, vii 124; essentials of good design, xiv 413; expansion of tubes, x 632; experiments with tubes inclined at various angles.....viii 481
Features combined with cylindrical, for marine purposes, viii 477; for British ships, xiii 732; French view.....xiv 536
German Navy, xii 571, xiv 74, 247; grates of, x 634; grouping of by types.....vii 99
History of early use.....v 933
In British destroyers, vii 797; in British Navy, xii 709; in foreign navies, xii 731, 743; in French Navy, vii 365; in German Navy, xiv 74; in high-speed ocean vessels, ix 776; in Swedish Navy, xiv 245; in vessels of the several naval powers, xiv 427; in U. S. Navy, xv 925; in world's navies.....xiv 493
Local peculiarities of fires of.....x 634
Necessity, x 996; Niclausse, safety, trials of, x 110; novel arrangement of feed-water heater in.....x 409
Present position as applied for marine purposes.....v 931
Requisites.....ii 166, x 106, xv 59
Screwed joints in fire space, x 636; Seabury, x 774; straight vs. curved tubes.....vii 113
The problem of combustion in, and a means of its solution.....x 723
Use of in mercantile marine.....ix 667
Velocity of circulation, effect on of inclination of tubes, viii 495; vessels for training men in management of.....vii 821
Water circulation, vii 104; Weir, combustion space arrangement, advantages of, x 728; Yarrow's experiments on circulation of water, viii 133; and cylindrical compared, *Cameo* and *Hero*, Babcock & Wilcox vs. *Dido*, *Othello* and *Zero*, ix 673; vs. cylindrical, *Hyacinth*, *Minerva*, Br., trials, xiv 458; for naval vessels.....xv 924
West: *Wachusett*, yacht.....viii 663
Weights: *Charleston*, iv 703; *Columbia*, iv 703; *Concord*, iv 703; *Cushing*, iv 703; *Karsarsky*, Schichau, and *Geiser*, Thornycroft, v 170; *Monterey*, cylindrical and water-tube, iv 703, vi 662; *New York*, iv 703, vi 661; Thornycroft, *Geiser*, Den., v 167; *Trenton*, iv 703; *San Francisco*, iv 703; Belleville and cylindrical, *Kherson*, *St. Petersburg*, Rus., and *Renown*, Br., compared, viii 639; Blechynden, *Scud*, yacht,

Boilers.
viii 874; British naval, vii 348, 364; cylindrical, weight and particulars, vi 395; different types, vi 411; Du Temple, torpedo boats, viii 787; *Spanker*, Br., viii 835; locomotive, *Satellit*, Aus., vi 394; Niclausse, *Cristobal Colon*, Sp., viii 854; per I.P.H. on some British vessels, viii 567, 568; Thornycroft, *Speedy*, Br., vi 394; Yarrow, *Hornet*, Br., vi 391
White: vi 365; ships fitted with, data.....xiv 498
Wild Duck, yacht, tests.....vii 79
Yarrow: v 947, vi 363, viii 589, 792; *Amethyst*, Br., xvi 1246; *Antrim*, Br., xiv 920; Argentine destroyers, viii 609, 804; British cruisers, xiv 234; circulation shown by model, viii 493; compared with others, xiv 419; development for use in battleships, xv 834; evaporative trial, xvi 288; *Express*, salt-water feed for, ix 388; *Fei-Ying*, China, vii 811; *Friesland*, *Holland*, *Zeeland*, Hol., vii 829, viii 406, 792; *Hampshire*, Br., xiv 921; *Hertag Hendrik*, Hol., xiv 339; *Hornet*, Br., vi 391; in various navies, xv 838; large tube, British report, xvi 920; interim report of the boiler committee, xiii 358; *Medea*, Br., xiv 643, xvi 336; type, *Nashville*, ix 584; *Salmon*, Br., vii 817; ships fitted with, data, xiv 506; *Sakol*, Rus., vii 606, 833; tests, vi 163; *Viper*, Br.....viii 806
Boiling points of liquefied gases at ordinary atmospheric pressure.....xi 506
Bolton, Reginald Pelham.—The equipment of tall office buildings in New York City.....xi 420
Bolts, steel, safe load, xiii 341; U. S. standard, strength of.....xiii 338
Boma, mer. str., sea-voyage performance.....xiii 834
Bonaventure, Br., details, v 226; trials.....vi 803
Books received.
Alternating Currents.—Bedell and Crehore.....v 529
Alternating Currents of Electricity.—Kapp.....v 529
American Steam Vessels.—Stanton.....vii 633
Architecture Navale.—Croneau.....vi 844
Busley's Naval and Merchant Steamers.....v 528
Cassier's Magazine, 1897.....ix 846
Clowe's Naval Pocketbook.....xvi 1026
Compressed Air.—Kennedy and Unwin.....iv 873
Construction Practique des Navires de Guerre.....ix 450
Continuous-Current Dynamos and Motors.—Cox.....v 1097
Dictionary of Electrical Words, Terms and Phrases.—Houston.....vi 646
Die Technische Entwicklung des Nord-Deustchen-Lloyds.—Busley and Haack.....vi 226
Electrical Tables and Memoranda.—Thompson and Thomas.....v 528
Electricity and Magnetism.—Houston.....v 252
Electricity One Hundred Years Ago and Today.—Houston.....vi 646
"Engineering" for April 21, 1893.....v 527
Frigate *Constitution*.—Hollis.....xii 1132
Handbook of the Steam Engine.—Haeder and Powles.....v 1095
Howell's Steam Vessels and Marine Engines.....viii 217

Books received.
Ingenieurs Taschenbuch....xiv 1284
Logarithmic Tables.—Jones....v 251
Lubricants, Oils and Greases.—Redwood....x 619
Manual of Naval Architecture.—White....vi 443
Marine Review....x 304
Marine Steam Engine.—Sennett and Oram....x 303
Mechanical Draft....x 304
Mechanical Drawing.—Bartlett....xiv 374
Mechanical Engineer's Pocketbook, etc.—Clark....iv 143
Mechanical Engineer's Reference Book.—Foley and Pray....iii 458
Monitor, The, and the Navy Under Steam.—Bennett....xii 1132
Morison Suspension Furnaces....x 619
Naval Engines and Machinery.—Barton....xvi 1345
Navires de Guerre, Essai sur leur Valeur Militaire....ix 450
Painting on Metal.—Sabin....x 1229
Practical Instructions for Using the Steam Engine Indicator....v 1096
Practical Marine Engineering.—Durand....xiv 374
Pray's Steam Tables and Engine Constants....vi 845
Proceedings of the Division of Marine and Naval Engineering and Naval Architecture of the International Engineering Congress....vi 224
Resistance and Propulsion of Ships.—Durand....x 618
Resistance of Ships and Screw Propulsion.—Taylor....v 1094
Royal Naval Engineer's Note Book.—Harvey....i 89
Royal Navy List....xvi 1026
Seaton & Roundthwaite's Pocketbook of Marine Engineering Rules and Tables....vi 443
Standard Tables for Electric Wiremen....v 1097
Steam....x 1229
Steam Navy of the United States.—Bennett....ix 213
"Technic," University of Michigan Annual, 1888....i 89
Text-Book of Naval Boilers.—Bieg....xvi 379
United States Standard Register of Shipping, 1899-1900....xi 552
Warships.—Attwood....xvi 1346
Boom in steel and iron....xi 756
Booth, A. W., see *Massassoit.*
Booth, W. H.—Smoke prevention....x 1064
Bored forgings compared with fluid-compressed....x 1016
Boring bars for stern tubes and struts, supports for....v 340
Boring stern tubes and alignment of shafting, Union Iron Works....v 7
Boring stern tubes and brackets, method of, *Cincinnati*....v 1
Boring stern tubes and struts, supports for boring bars....v 340
Borneo oil for fuel....xi 446
Borodino, Rus., data....xi 1115
Borthwick, J. L. D., Chief Engr., U. S. N. (retired).—Obituary....xvi 1342
Bosnia, mer. str., launch and des....x 1213
Boston, authorization and data, i 236; trials interrupted, i 252; trials, measured mile, i 354; boiler and engine data, iii 422; propeller data,

iv 158, 402; machinery space, i 249; coal endurance, iv 668; air-pump data, vi 532; steaming radius.....xiii 54
Boston defender (yacht), data.....xiii 321
Bottom, ships, foul condition of, increase of horsepower for a given speed, due to.....i 73
Bouët Willaumez, Fr., wreck of.....xii 1107
Bourke, Maurice A., Captain, R. N.—Defense on loss of *Victoria*, Br.....vi 93
Bourrasque, Fr., des., xiv 663; speed.....xiv 325
Bouvet, Fr., launch and des., viii 623; dimensions.....x 879
Bouvines, Fr., des., ii 235; test of D'Allest boilers, vii 402; trials, vii 604; speed.....viii 403
Bow wave, energy of.....xi 591
Bowden, Smith, Sir N., Admiral, R. N.—Discussion, conversions and re-armament of ships.....xiii 627
Bowers, F. C., Lt. Comdr., U. S. N.—The U. S. S. *Cleveland*, general des., official trial.....xv 1110
Boxer, Br., des. and trial.....vii 169, 715
Boyarin, Rus., launch.....xiii 791, xiv 363
Boyd, J. T.—Obituary.....xvi 1342
Boyne, Br., launch.....xvi 1326
Braces for cylindrical boilers, formulae for strength of.....viii 269
Braemar Castle, mer. str., des.....x 605
Bracket bearing and stern tubes, method of boring out, *Cincinnati*.....v 1
Brake, Westinghouse.....xi 1071
Bramble, Br., contract, ix 804; trials.....xii 246
Brandenburg, Ger., boiler accident, vi 416; data compared with triple screw, xiii 404; coal-consumption and boiler data.....xiv 116
Brass, naval, xv 200; relation of bismuth to fire-cracks, x 1069; tips, burning on cast-iron propellers, xiv 1225; tubing, method of manufacture.....xv 197
Brassy, Lord, K. C. B., D. C. L.—Mercantile auxiliaries, xiii 607; conversions and re-armaments of ships on the effective list.....xiii 617
Brazed copper, steam pipes.....x 510
Brazed work, copper piping, defects in, *Concord's* main steam pipe.....iii 399
Brazen (Br.), general data, vii 820; launch, viii 621; trials.....xiii 271
Brazil, contracts for armored vessels in France, vii 154; torpedo boats, Schichau, dimensions.....vii 418
Breakdowns: British Navy, xvi 331; naval maneuvers, British, 1892, iv 837; of machinery during the fleet maneuvers of 1890 (France) iii 280; *Aquila*, It., vii 605; *Blake*, Br., boilers, viii 614; *Cassini*, Fr., eccentrics and propellers, viii 191; *Charleston*, vii 789; *Concord*, main steam pipe, iii 399; *City of Lincoln*, mer. str., steam pipe explosion, v 351; *Desperate*, Br., I.P. engine, on trial, viii 621; *Elbe* and *Lahn*, mer. strs., copper steam pipe, iii 410; *Ericsson*, vii 572; *Fleurus*, Fr., vii 173; French torpedo boat *No. 73*, vii 430; *Jauréguiberry*, Fr., boilers, on trial, viii 624; *La Gascogne*, mer. str., vii 139; *Lansquenet*, Fr., vii, 430; *Latouche-Treville*, Fr., vii 172; *Lynx*, Br., vii 170; *Opossum*, Br., after repairs, viii 843; *Powerful*, Br., on trial, viii 827; *Rocket*, Br., viii

621; *Seagull*, Br., iii 457; *Shark*, Br., vii 170; *Skate*, Br., propeller bracket, on trial, viii 620; *St. Paul*, mer. str., steam pipe, viii 155; *Terrible*, Br., on trial, viii 811; *Trave*, mer. str., broken shaft, v 188; *Umbria*, mer. str., repairing broken shaft.....v 185
Breakdowns, see also Accidents to machinery, and Casualties and repairs.
Breech mechanisms, Vicker's guns.....x 670
Bremen, mer. str., des., ix 831, viii 861; displacement, ix 201; reconstruction.....xiii 1140
Bremen, Ger., progress on.....xvi 357
Brennus, Fr., launch and des., iii 601, vi 806; trials.....viii 186
Brésil, mer. str., cylindrical boilers of, compared with Belleville on *Australien*.....viii 152
Brett, W. J. Nowers,—Steam pipes, their material, workmanship, and arrangement.....v 347
Brice-Douglass (Kirk) valve gears.....iii 551
Bridge cables, East river.....xii 226
Bridges, Atbara, xi 997; Japanese.....xi 1072
Brilliant, Br., work on, ii 421; trials.....iv 832
Briquettes as fuel for trial trips, x 522; French, evaporative efficiency...vii 578
Bristol thermometer.....viii 117
Britannic, mer. str., data.....vi 162
British Admiralty, scheme of training naval officers.....xv 144
British and American blast-furnace practice.....xii 1077
British corporation for registry and survey of shipping.....v 661
British cruisers, compared with those building at Barrow, *Powerful*, *Niobe*, *Doris*.....viii 557
British Navy, breakdowns of machinery, xvi 331; engineering in, vii 779; estimates, 1897, ix 397; estimates, 1898, x 523; maneuvers, criticism on too light machinery of vessels, i 90; maneuvers, 1892, iv 786; mishaps in, iv 837; Niclausse boiler installations, xv 1172; ordnance trials, vi 168; prize, naval essay, xii 1021; shipbuilding program, 1895, vii 145; supplementary program for new ships, x 789; trials of torpedo-boat destroyers, xiv 46; warship building in 1903, xvi 250; water-tube boilers in, xii 709; Yarrow boilers in.....xv 838
British warships, the machinery of.....vii 332
Britomart, Br., contract, ix 804; trials.....xii 247, xiii 274
Briton, mer. str., data.....x 284
Britannia, Br., machinery contracts.....xvi 338
Britannia, mer. str., dimensions and data.....iv 102
Brittleness produced in soft steel by annealing.—Stead.....x 965
Broken crank shaft of S. S. *Trave*.....v 188
Bromo, mer. str., data of quadruple-expansion engine.....i 78
Bronze, aluminum, iii 490; deoxidized, iii 497; manganese, Parsons, iii 491; phosphor, iii 496; silicon, iii 498; Tobin, iii 494, xv 205; phosphor, bolts, standard U. S. safe load.....xiii 341
Brooklyn, bids, v 201; des., iv 805; launch, vii 804; trials, ix 400; steaming radius for, xiii 54; list of engines and steam cylinders, viii 761; high smoke pipes, v 175, vi 669; contract trials.....viii 741

Brown's improved corrugated furnace, tests ....xv 182
Brown, Morris H., Lt., U. S. N.—Obituary..... .....xvi 1342
Brown valve gear, No. 1, iii 542; No. 2, iii 544; No. 3.....iii 545
Brown, W. H. (see *Piscataqua*), auxiliary navy, x 535; des., x 600; data.....x 824
Bruiser, Br., launch and des.....vii 419
Bruix, Fr., des., ii 235, 422, iv 841; note.....ix 177
Brutus, data.....x 824
Bryan, B. C., Lt. Comdr., U. S. N.—Effect of temperature on metals and alloys, ii 144; practical application of formulae for finding the turning effort on the crank shaft of an engine, vi 334; trials of the Lake steamers *Zenith City* and *Victory*, vii 765; coal-consumption tests of S. S. *John W. Gates*, xii 895; test of the machinery of the Minnesota S. S. Co.'s steamer *Pennsylvania*, xi 557; steaming radius of U. S. naval vessels, xiii 50; evaporative test, Babcock & Wilcox boiler, etc.....xvi 133
Bryant, Geo. H.—Comparison of the hollow-bored method and the fluid-compression hollow-forged method of making steel forgings, x 1016; reply to discussion.....x 1029
Buda-Pesth, Aus., des., vii 811; launch, viii 610; trials.....x 222
Buenos Aires, Arg. Rep., des. and trial.....vii 806, viii 607
Buenos Aires, mer. str., data of quadruple expansion engines.....i 78
Buffalo, data, x 534; steaming radius..... .....xiii 56
Bugeaud, Fr., des., iv 519; launch, v 1064; comparison of her Belleville boilers with D'Allest and Niclausse, vii 408; weights of machinery, vii 409; trials, viii 404; Belleville boilers.....xiii 404
Buicella, mer. str., trials..... .....vi 590
Buistri, Rus., speed.....xiv 1265
Bulkheads, scantlings of and method of stiffening..... .....iv 787
Bulk oil carrier, des..... .....x 598
Bullfinch, Br., trials.....xiii 271, xiv 208
Bulwark, Br., launch and des., xi 1099; trials.....xiii 717, xiv 206
Bulwark class, Br., data.....xi 320
Bunkers, arrangement for better coaling..... .....xiii 2
Bunker water-tight doors..... .....viii 334
Burd, G. E., P. A. Engr., U. S. N.—Discussion, engine-room signals..iii 446
Burgoyne, A. H.—Progress of the submarine in 1903..... xvi 666
Burners, liquid-fuel, xv 245; oil, liquid-fuel report..... xvi 719
Burning brass tips on cast-iron propellers.....xiv 1225
Burning liquid fuel, new method.....xiv 267
Burning of the North German Lloyd steamships and docks, Hoboken, N. J.....xii 843
Burning or mending of castings.....xiii 205
Burning powdered coal in stationary boilers.....xiii 174
Bursting of small cast-iron flywheels.....xi 212
Bursting of the *Concord's* main steam pipe, iii 399; discussion: Kirk, iii 416; Marshall, iii 417; Parker.....iii 419
Bursting of the copper steam pipes on steamships *Elbe* and *Lahn*.....iii 410
Burton plastic pressure tube expander.....xiii 208

Bush, W. W., Lieut., U. S. N.—Contract trial of the U. S. S. *Wyoming*.....xv 83
Busley, Carl.—The development of the marine engine in the last decades, i 151; on spacious firerooms of *Hohenzollern*, Ger., vii 432; triple-screw vessels.....viii 782
Busley's Naval and Merchant Steamers.—Book received.....v 528
Buteshire, mer. str., boilers, Ellis & Eaves draft.....vi 748
Butterworth, James, Chief Engineer, U. S. N.—Obituary.....iii 613
Butt straps, boiler, formulae for.....iv 403
Butt-strap riveted joints, tests of, at Watertown Arsenal for Bureau Steam Engineering.....iv 624
Buzzard, Ger., coal-consumption and boiler data.....xiv 116
By-laws of the American Society of Naval Engineers...iv 144, 256; x 1237; xi 819; change.....xi 555

C

C3, Fr., dimensions.....ix 175
Cables, bridge, East River.....xii 226
Cadmus, Br., note, xiv 637; trials.....xvi 339
Caesar, auxiliary navy, x 535; data.....x 824
Caesar, Br., dimensions, vi 423; launch, viii 810; trials.....ix 801, xi 318
Cahaba coal (Alabama).....i 121
Calcic carbonate, scale in boilers.....iv 685
Calcic sulphate scale in boilers.....iv 686
Calculation of horsepower for marine propulsion.—English, viii 310; discussion: Froude, 316; Barr, 317; Robinson, 317; reply to discussion.....317
Calculating machines.....xii 169
Caledonia, mer. str., des.....vi 643, vii 192
California, characteristics, xii 810; compared to *King Alfred*, Br., xiv 314; launch and des.....xvi 678
Californian, mer. str., data.....xii 852
Calliope, Br., at Samoa.....i 209
Calorimeters: coal, new, x 204; determination of the dryness of steam, vii 297; for boiler tests, coal analysis, x 130; steam, vii 297; throttling tests, vii 140; the reliability of.....viii 98
Calumet, data.....x 534
Calvert, George A.—On the measurement of wake currents.....v 869
Calypso, Br., des.....i 264
Calypso, yacht, des.....vii 631
Cambrian, Br., launch and des.....v 510
Cambrian, mer. str., launch and des.....ix 199
Cameo, mer. str., Babcock & Wilcox boilers.....viii 770
Camera, use of in mechanical engineering.....xi 692
Campania, mer. str., launch and des., iv 852; des., v 247, 810; des. and trial, v 385; speed, v 405, 409, 754; height of smoke pipes, v 247; records, Sept., Oct., Nov., 1893, v 818, 1019; vi 438, 597, 790; data, vi 162, xiv 1272; time of runs, etc., vi 439; machinery space.....xiii 867

Campania and *Great Eastern*, mer. strs., compared.....v 810
Camperdown, Br., description, i 264; endurance trial, iii 132; collision with *Victoria*, v 693, vi 47; injury in collision with *Victoria*, v 1041, vi 107; repairs, vi 1041; coal consumption.....iii 133, xiii 1029, 1031, 1032
Canada, mer. str., des.....ix 197
Canadian Atlantic service, steamers for .....vi 642
Canadian Pacific railway steamers.....i 363
Canaga, A. B., Comdr., U. S. N.--Graphic method for determining the influence of the angularity of the connecting rod and of the weight of the reciprocating parts of the steam engine, i 271; graphic method for determining and counterbalancing the centrifugal action of the connecting rod, ii 433; formulae for the strength of seams, stays and braces for cylindrical boilers, viii 269; report on turbine installations, xvi 1095
Canal, Sault Ste. Marie, data.....v 143
Canopus, Br., note, viii 612, 807; data, ix 408, xi 241; launch, ix 802; battery compared to *Alabama*, x 786; machinery data, xi 330; trials, xi 1100, xii 246; Spezzia to Malta.....xii 738
Canopus class, Br., trials.....xi 320
Capacity and duty tests pumping engines, Washington, D. C.—Baird.....i 41
Capacity limits in direct-current machines.. .....xi 1064
Cape Ann, mer. str., des.....vii 624
Cape Charles, mer. str., data.....x 602
Capitan Muniz Gamero, Chili, launch, viii 386; speed.....viii 807
Capitan Prat, Chili, des., iii 287; iv 128; trial, v 231; voyage from Toulon to Talcahuano.....v 1066
Capitan Orella, Chili, launch, viii 386; trials.....viii 807;
Capper, D. S.—Test of a model Thornycroft boiler.....vii 730
Caprera, It., launch, vi 620; trials.....vii 832
Caps, Niclausse boiler tubes.....xiii 383
Captain Sacken, Rus., boilers, new.....x 582
Cap Verde, mer. str., des.....xiii 794
Caramaru, Brazil, launch.....viii 611
Carbon, effect in cupola practice.....x 1050
Carbonic acid refrigerating machinery.....vi 783
Carbonic anhydride ice machines of captured Spanish gunboats.—Holmes.....xiv 525
Carbonizing process.—Harvey.....iv 512
Carborundum.....xii 526
Cardinal Jiminez de Cisneros, Sp., launch.....ix 437
Care of machinery, iv 726; in the English Navy.....xiv 271
Care of marine boilers.—Forsyth, v 574; steam boilers.....x 768
Care of torpedo boats in reserve.—Davison.....xv 756
Care of water-tube boilers in the British Navy.....x 523
Car ferry *Sainte Marie*.....v 759
Cargo steamers, Atlantic.....xi 703
Cargo steamers, coal consumption.....xiv 705

Carinthia, mer. str., trial and des.....vii 843
Carisbrook Castle, mer. str., des.....x 285
Carlo Alberto, It., launch, viii 414; launch and dimensions, viii 850; speed.....x 892, xiv 979
Carlos V, Sp., launch and des., vii 434; des.....viii 200
Carlow, mer. str., dimensions.....viii 656
Carnarvon, Br., combination boilers, Niclausse and cylindrical, xiv 921; launch and des.....xvi 344
Carney, R. E., Asst. Engr., U. S. N. (retired).—Comparison of the performances of the monitors *Arkansas*, *Florida*, *Nevada* and *Wyoming*, xv 823; contract trial of the *Olympia*.....vi 241
Carnot, Fr., launch and des., vi 618; des., viii 401; boilers, D'Allest, des. and weights, vii 385; speed, viii 625; trials.....ix 174
Caronia, new Cunard liner.....xvi 1020
Carr, C. A., Lt. Comdr., U. S. N.—Discussion, trial trips and the lessons to be learned from them, iii 176; speed curves of ships building for the U. S. Navy, iii 555; the failure of steel castings for U. S. S. *Maine* (old) and Cruiser *No. 11*, iv 83; the contract trials of the U. S. S. *Marblehead*.....vi 129
Carter, Thomas F., P. A. Engr., U. S. N.—The United States triple-screw protected cruiser *Columbia*.....vi 1
Casabianca, Fr., des., vi 206; speed.....viii 405
Case hardening wrought iron and machine steel.—Markham.....xiv 590
Cassard, Fr., dimensions, vi 204; launch, viii 626; speed.....ix 813
Cassier's Magazine, 1897. Book received.....ix 846
Cassini, Fr., preliminary trials, vii 430; breakdown, viii 191; trial, viii 405
Cassius, data, x 824; steaming radius.....xiii 56
Cast aluminum.....xi 1072
Castelfiardo, It., experiments with petroleum as fuel.....iii 282
Castilian, mer. str., data.....xi 543
Castine, gunboat *No. 6*, launch, iv 294; des. and contract trials, v 846; alterations in, vi 176; air pump, data, vi 532; run from South America.....ix 125
Casting and loam molding of cylinders, *Cincinnati* and *Raleigh*.....iv 376
Casting and molding steel.....xv 130
Castings and patterns as witnesses.....xi 474
Castings: burning or mending of, xiii 205; machinery, fillets and round corners, xi 1010; open-hearth steel, manufacture of, i 185; steel, i 193, xv 122; cost of, iv 89; loss in finishing, i 204; *Maine* (old) and Cruiser *No. 11*, failures of, iv 83; manufacture, tests, and defects, xv 618; (Strickland), v 39; tensile tests and analyses, i 206; Tropenas process, x 701; weights and analyses of charges for.....i 194
Casting temperature, influence upon steel.....xi 730
Cast iron, crystallization and segregation.....xi 1001
Cast-iron flywheel, bursting of.....xi 212
Cast iron: malleable, xi 161; modern cupola practice, x 1045; propellers, burning brass tips on, xiv 1225; the melting point of.....x 1009
Cast-steel piston, failure of on *Charleston*.....vii 789

Cast-steel propeller hubs, xi 446; steam pipe, defective.....xi 699
Casualties and repairs (see also Accidents and Breakdowns): notes, i 88; two crank-shaft brasses for *Fish Hawk*.—Leonard, i 74; breakdown of air-pump gear, *Tallapoosa*.—Kearney, i 248; miscellaneous, i 364; repair of a broken crank pin.....iii 456
Casualties, machinery, *City of Paris*, ii 238; naval maneuvers, British, 1892.....iv 837
Catania, yacht, des.....vii 628
Cathcart, W. Ledyard.—Discussion, experimental station and engineer school, vii 463; water-tube vs. cylindrical boilers for naval vessels...xv 924
Catinat, Fr., des., vi 205; launch, viii 849; trials.....x 577
Caulking boilers.....v 897
Causes of the vibrations of screw steamers.—Taylor.....iii 12
Caustic soda, effect on boilers.....xii 441
Cavitation by screw propellers at high speeds, ix 678; *Turbinia* tests...ix 375
Cavite naval station, xi 721; engineering plant, xi 893; repairing vessels at.....xi 1042
Cavite steel floating dry dock.—Cunningham.....xv 472
Cawley.—Discussion—determination of the dryness of steam.....vii 321
Cécille, Fr., des. and trials, i 180, iii 135; particulars and defects in, iv 314; performance data.....v 504
Cedric, mer. str., data.....xiv 1278
Celluloid, substitute for.....xii 517
Cellulose, water-excluding properties, iii 466; corn pith, x 1160; manufacture of, xiii 195; use in warships.....xiii 195
Celtic, data, x 824; steaming radius.....xiii 56
Celtic, mer. str., des. xiii 516; machinery space, xiii 867; dimensions, machinery weights, data.....xiii 862
Celtic King, see *Celtic*.
Cement, iron "smooth-on," xiii 207; Portland, for steam joints.....v 194
Centaur, Br., des.....iii 134
Center of gravity of locomotives.....xi 1040
Central power plants on board ship vs. distribution of power.—Aldrich..x 95
Centrifugal action of connecting rod, determining and counter balancing.....ii 433
Centrifugal fans, design and testing.....ix 293
Centrifugal oil burners.....xvi 761
Centrifugal pump tests.—Kent, Denton.....xvi 547
Centrifugal pump, theory of, part I.—Leopold, iii 335; part II.....iii 483
Centrifugal pumps, v 295; form of vane, iii 558; tests.....xiii 719
Centurion, Br., details, v 226; trials, v 1044, vi 182; size and cost, vi 495; ordnance trials.....vi 168
Ceres, mer. str., trials.....vi 590
Cesarevitch, Rus., data.....xii 261, 575
Cevic, mer. str., launch.....v 1076
Chacabuco, Chili, purchase.....xiv 618
Chalker, J. H., Asst. Engr., U. S. R. M.—Discussion—tubulous boilers...ii 557

Challenger, Br., data, xiv 950; trials, xvi 258; Babcock & Wilcox boilers, xvi 263; Babcock & Wilcox boilers, coal consumption.....xvi 263
Chamber burners, oil.....xvi 846
Chambers, W. H., Asst. Engr., U. S. N.—The contract trial of the U. S. S. *Philadelphia*, ii 524; discussion, trial trips, and the lessons to be learned from them.....iii 175
Chamois, Br., launch, ix 174; trials, ix 805; loss of.....xvi 1327
Chanda, mer. str., trials.....vi 590
Chandler-Linnard report on torpedo boats and destroyers.....xiv 282
Changes in Lloyd's rules for shafting.....xii 794
Channel, new, in New York harbor.....xi 777
Channel Steamer, machinery data.....viii 568
Chanzy, Fr., des.....ii 235, 422
Characteristics of the Normand water-tube boiler.—Normand.....xv 1065
Charbues, Arg. Rep., data.....xiv 949
Charger, Br., trials.....xi 328, xiv 208
Charges for steel castings, weights, and analyses.....i 194
Charlemagne, Fr., des., vi 427; launch, vii 823; speed, x 577; trials, x 875; comparative trials, xii 254; repairs.....xiii 288
Charles V., mer. str., trials.....vi 590
Charles Martel, Fr., launch and des., v 1063; preliminary trials, viii 847; boiler tubes, ix 422; compared to Ramillies, Br.....x 1200
Charleston, des. and contract trial, i 310; authorization and data, i 236; date of trial, i 83; test of evaporators, i 291; preliminary trials, i 250; boilers, ii 143; boiler weights, iv 703; boiler data, iii 422; engine vibrations, iii 16; engine data, iii 422; propeller data, iv 158, 402; coal endurance, iv 640, 639; coal expenditure, iv 683, v 70; Marshall valve gear, ii 3; power of auxiliary machinery, iii 217; air-pump data, vi 532; weights and performance, vi 652; failure of steel piston, vii 789; chase of the *Itata*, machinery defects developed, iv 361; wreck of..xi 1085, xii 203
Charleston (new), data, xii 822; characteristics, xii 1086; launch and des.....xvi 333
Charner, Fr., des., ii 235, 422; characteristics.....iii 142, iv 841
Chart, graphical, for valve-gear problems.....xiv 1141
Charybdis, Br., trial.....vi 605
Chase of the *Itata*.—Hollis.....iv 361
Chasseloup-Laubat, Fr., trials, vii 429; D'Allest boilers compared with Belleville and Niclausse, vii 408; machinery weights.....vii 409
Chateaurenault, general data, vii 825; Fr., launch and des., x 578, 879; boilers, xii 569; note, vii 825, xiii 781; speed, xii 1105, xiv 967; trials, xiii 1092, xiv 664; final trials.....xiv 1253
Chatham, see *Vulcan*.
Chattanooga, data.....xi 508, 1081
Chauncey, named, x 817; launch, xiii 1085; full data, xiii 1082; contract and standardization trial.....xiv 1003
Cheerful, Br., launch, ix 808; speed.....x 1196, xi 1101
Chelydia, mer. str., trials.....vi 590
Chemical means for measuring feed and circulating water.....viii 517

Cherry Creek coal, analysis.....vi 460
Cherwell, Br., trials.....xvi 690
Chesapeake, practice vessel, des.....i 352
Chesapeake, mer. str., launch and des., vii 624; speed.....vii 853
Chesma, Rus., repairs.....xiv 682
Chelolah, yacht, des.....x 615
Chevalier, Fr., torpedo boat, vi 585; comparative data.....ix 35
Chicago, machinery space, i 249; authorization and data, i 236; engine and boiler data, iii 422; propeller data, iv 158, 402; trials, measured mile, i 354; air-pump data, vi 532; coal endurance, iv 667; repairs to, engines rebuilt, Babcock & Wilcox boilers, viii 383; inertia stresses of valve gear, xii 913; steaming radius.....xiii 56
Chicago, mer. str., data.....x 920
Chicago Shipbuilding Co.'s machine shop.....x 515
Chickasaw, data.....x 824
Chicora, mer. str., trial and des.....iv 865
Child, Charles T.—Electrical propulsion for torpedo boats.....x 958
Chile, mer. str., Belleville boilers.....viii 153
Chil Howee, yacht, des.....xi 277
Chilian coals, notes on.....i 70
Chilian Navy, orders for four destroyers, 30-knot, vii 811; Niclausse boilers in, xv 1173; Yarrow boilers in.....xv 838
Chilka, mer. str., trials.....vi 590
Chimney gas analyses.....xvi 983
China, iron supply.....xii 1085
China, mer. str., particulars viii 422; record run.....x 276
Chindwin, Upper, stern-wheel gunboat for.....iv 836
Chinese cruisers (three), 1896.....viii 612
Christine, yacht, dimensions.....ix 211
Christopher Columbus, mer. str., des.....v 240
Chishima-Kan, Jap., torpedo gun vessel, launch.....iv 318
Chitose, Jap., launch and des.....x 266, 582, xi 256
Chiyoda, Jap., des.....ii 428
Chi-Yüen, Chinese, mention in battle of Yalu.....viii 370
Chrome-steel.....iii 503
Chromium, silicon and nickel steels, special.....xi 144
Choctaw, auxiliary navy, x 535; data.....x 824
Cincinnati, des., i 349; speed curve, iii 556; work on, iv 293; cylinders, molding in loam and casting, iv 376; launch and des., iv 817; running lines for shafting, and boaring out stern tubes and brackets, v 1; machinery accident, xi 214; tests of Babcock & Wilcox boilers, xii 882; steaming radius, xiii 56; boiler test, xiii 223; boilers, performance data.....xvi 153, 163
Circe, Br., launch and des., iv 533; details, v 226; des., v 510; des. and trial, vi 200; trials.....v 512, xvi 258
Cire-perdu process, steel castings.....xv 142
Circulars, Navy Regulation, Nos. 52 and 53, Examinations of Engineer Officers, i 93–95; rescinded, replaced by Nos. 109, 110.....iv 462–468

Circulating and feed-water, measurement by chemical means.....viii 517
Circulating pumps.—Leopold.....v 295
Circulating pumps, auxiliary engines, etc.....iii 583
Circulation in the Thornycroft water-tube boiler.....vi 349
Circulation in water-tube boilers, effect on evaporation.....xii 194
Circulation in water-tube boilers shown by models, discussion: Watkinson, viii 489; Durston, viii 501; Yarrow, viii 505; Normand, viii 507; Thornycroft, viii 508; Robinson, viii 509; Thom, viii 509; Blechynden, viii 510; Lambert, viii 511; Wingfield.....viii 514
Circulation of water in water-tube boilers, Yarrow's experiments.....viii 133
Cirujano Videla, Chili, note.....ix 406
City of Alpena, mer. str., des. and trials.....v 973
City of Bangor, mer. str., des. aud launch.....viii 424
City of Berlin, mer. str., data.....vi 162
City of Buffalo, mer. str., des.....viii 428
City of Erie, mer. str., race with *Tashmoo*.....xiii 795
City of Lincoln, mer. str., steam pipe explosion.....v 351
City of Lowell, mer. str., des., v 1088; data.....vi 633
City of Mackinac, see *City of Alpena*.
City of New York, mer. str. (see *New York*, mer. str.), des., i 166; transfer to American register.....iv 320
City of Paris, mer. str. (see *Paris*, mer. str.), des., i 167; accident to machinery, ii 238; investigation of accident, ii 429; new explanation of accident, iii 122; repairs to, iii 467; dimensions and data, iv 102; transfer to American register, iv 320; data, vi 162; accident to.....vi 290
City of Peking, auxiliary navy, x 538; data.....x 824
City of Rome, mer. str., dimensions and data, iv 102; data.....vi 162
City of Trenton, mer. str., explosion.....xiii 1078
City of Venice, data of quadruple-expansion engines, etc.....i 79
Clamer, G. H.—Study of alloys for bearing purposes.....xvi 964
Clan Line steamer, machinery data.....viii 568
Clara, yacht, test to determine a continuous record of engines.....ix 6
Clark automatic coaling and weighing barge.....xiii 27
Clark.—Discussion, determination of the dryness of steam.....vii 324
Clark, D. Kinnear.—The Mechanical Engineers' Pocket-Book, etc.....iv 143
Clarkson.—Discussion, determination of the dryness of steam.....vii 319
Classification of ships, new, 1892.....iv 113
Classification, society, new.....v 661
Classified speeds of British naval vessels.....v 190
Claudius, mer. str., des.....xi 542
Cleaning machinery by means of blotting paper.....x 1157
Cleaning stations, engineer division.....xiii 925, xvi 1184
Clearances, cylinder, compression of steam in, xii 770; influence on steam consumption of compression in, xii 315; effect in gas and oil engines, x 169; *Denver*, xvi 622; *Ohio*, xvi 1040; *Tacoma*, xvi 10; *Tingey*.....xvi 55
Clearance space, compression of steam in.....x 641
Clearfield (Pa.) coal, analyses.....xi 885

Cleveland, data, xi 508, 1081; launch, xiii 1083; des. and contract trials.....xv 1110
Cleveland Shipbuilding Co., lake steamers, dimensions.....vii 178
Cline, Hugh Hadaway, Chief Engineer, U. S. N., retired.—Obituary...x 1231
Clinometer, Webster's.....iii 348
Clio, Br., note, xiv 637; trials.....xvi 258, 346
Closed ash pit, forced-draft test, Babcock & Wilcox boilers.....xvi 133
Closed fireroom, forced-draft test, Babcock & Wilcox boiler.....xvi 133
Clothing and lagging of steam-heated surfaces.....x 708
Clover, R., Captain, U. S. N.—Discussion: design of a fast scout.....xiii 416
Coal.—Hollis.....iv 740
Coal: actual and theoretical evaporative results, x 131; Alabama, comparative tests, i 122; and oil, compared as fuel, vii 749; *Alameda*, comparative performance, xvi 806; anthracite, *Charleston*, iv 361; anthracite, Lykens Valley, analysis, x 112; as fuel for boiler testing, x 130; Cahaba (Alabama), i 121; carried by vessel, influence on design, xvi 161; Cherry Creek, analysis, vi 460; Clearfield (Pa.), analyses, xi 885; Coosa (Alabama), i 121; cost and difficulty of procuring, xiii 41; Darlington (Pa.), tests, xi 97; distribution of power from combustion of in furnaces, iv 655; evaporation of, xi 104; from various localities, volatile matter, fixed carbon and heating value, x 133; George's Creek, (Cumberland), vaporization of, vii 329; Hocking, tests, xi 96; Hohenstein boiler test, analysis, xvi 737; in combination with liquid fuel, vi 415; in Germany, xii 524; in Japan, xiii 180; in Tonquin, iii 125; kinds of, quality, and methods of burning to best advantage, iv 740; Lehigh anthracite, tests under Corliss boilers, i 299; measurement and expenditure, xiii 936; moisture in, allowance for in boiler testing, x 133; Ohio, "Jackson," analysis, xi 94; Pittsburg, tests, xi 97; Pocahontas, analysis, vii 699; tests, xi 96; pulverized, as fuel, xii 1075; regulations on, xvi 1213; relative consumption of triple-expansion and compound engines, iv 782; relative value of various, xi 105; reserve of the world, x 776; sampling and determining for boiler trials, xii 46; semi-bituminous, tests in *Cushing*, iv 36; semi-bituminous, Eureka (Clearfield, Pa.,) analysis, x 113; smokeless, xi 1070; spontaneous combustion of, xii 1073; spontaneous ignition of, iii 577; supply, new cruisers, Br., iv 796; Thacker, tests, xi 96; Upper Freeport, tests, xi 97; valuation of, xi 92; *Ville de Douvres*, mer. str., trials, analysis, iv 414; 546; "Warrior" (Alabama), i 120; world's production.....xiii 177
Coal calorimeter, new.....x 204
Coal, combustion of, distribution of the total heat of.....iv 548
Coal consumption and speed curves.....xv 366
Coal consumption: *Arkansas*, *Florida*, *Nevada* and *Wyoming* compared, xv 824; Belleville boilers vs. cylindrical, Messageries Maritime Company, viii 151; *County* class, Br., xvi 262; French Navy, instructions for determining, ii 406; in men-of-war, iv 109; method of calculating from B. T. U.'s per minute per I.H.P., xi 971; of some British vessels, vii 415; requirements for new British destroyers, viii 399; tests, *Cushing*, iv 36; tests of S. S. *John W. Gates*.—Bryan, xii 895; trial, torpedo boat *No. 128*, Fr.....iii 273

Coal consumption data.
Albatross, Fish Com. str., vi 511; *Alert*, Br., viii 172; *Amethyst*, *Topaze*, *Sapphire*, Br., xvi 1247; *Ardent*, Br., vii 423; *Atlanta*, iv 669; *Australien* and *Polynesien*, mer. strs., Belleville boilers, vs. *Brésil* and *La Plata*, cylindrical boilers.....viii 154
Babcock & Wilcox boiler test, *Nebraska*, xvi 151; *Baltimore*, i 345, ii 124, iii 582, iv 663; Belleville boilers, with Ericsson engine, ii 473; *Bennington*, iii 215, iv 662; *Bergen*, ferry, ii 283; *Boston*, iii 582, iv 668; *Brennus*, Br., vii 384; *Bruiser*, Br.....vii 419
Castine, v 868; *Charleston*, i 327, iii 382, v 70, vi 686; Chase of *Itata*, iv 369; *Chicago*, iii 582, iv 667; *Cleveland*, xv 1134; *Colchester*, mer. str., ii 357; Commandant's barge, New York Navy Yard, i 26; *Columbia*, vi 45; *Concord*, iii 97, 582, iv 666; *Condor*, It., xii 80; Corliss boilers, i 308; *Crescent*, Br., vii 415; *Cushing*, tests.....iv 42
Denver, xvi 619, 87; *Descartes*, Fr., viii 849; *Diadem*, Br., auxiliary machinery, x 434; *Diana*, Br., viii 833; *Dolphin*, iii 582; with coke, vi 741; with George's Creek coal.....vii 330
Fusi Yama, Jap.....ii 346
German naval vessels, xiv 116; *Grafton*, Br.....vii 415
Inchdune and *Inchmarlo*, mer. strs., xiii 151; *Indiana*, vii 666; *Infanta Maria Teresa*, Sp., v 968; *Iona*, mer. str., iii 390; *Iroquois*, mer. str.....vi 449, 451, 460
Katahdin, viii 17; *Kearsarge*, xi 850; *Kentucky*.....xii 24
Machias, v 868; *Magnificent*, Br., vii 811; *Maine* (old), vii 31; *Majestic*, Br., vii 812; *Marblehead*, vi 146; *Marietta*, ix 654; *Meteor*, i 231, 235; *Minerva*, Br., viii 832; *Minneapolis*, vi 713; *Missouri*.....xv 1209
Nashville, ix 591; *Nevada*, xv 108; *Newark*, iii 118, 582, iv 666; *Newport*, ix 559; *New York*, v 635; Niclausse boiler tests, x 115; Niclausse test boiler.....xi 886
Ohio, xvi 1059; *Olympia*, vi 257; *Oregon*.....viii 476
Pascal, Fr., viii 849; *Petrel*, iii 582, iv 670; *Philadelphia*, ii 534, 536, iii 582, iv 664, vi 689; *Powerful*, Br., viii 812; *Prince George*, Br., viii 809; Pumping engine tests, Washington, D. C.....i 59
Royal Arthur, Br., vii 347; *Royal Sovereign*, Br.....vii 347
San Francisco, iii 582, iv 665; *Sharpshooter*, Br., vii 415; *Shearwater* Br., ii 488; *Sirius*, Br., vii 363; *Speedy*, Br., vii 415; *Starfish*, Br...vii 818
Tacoma, xvi 30; *Tartar*, mer. str., ii 368; *Terrible*, Br., viii 811, xvi 1298; *Texas*, viii 94; *Torch*, Br., viii 172; typical ocean steamers (forty), vi 162
Various boilers, ii 172; *Venus*, Br., viii 830; *Vesuvius*, iii 582; *Vicksburg*, ix 559; *Victorious*, Br., viii 808; *Victory*, mer. str., vii 777; *Ville de Douvres*, mer. str.....iv 414, 427, 579
Waldo, mer. str., viii 858; *Wheeling*, ix 654; *Wilk Duck*, yacht, vii 88; *Wisconsin*, xii 997; with retarders, Scotch boilers, viii 778; *Wyoming*.....xv 100
Yosemite, yacht, vii 693; *Yorktown*,.....iii 582, iv 642, 671
Zenith City, mer. str.....vii 774
Coal depot, floating, Br.....xvi 347, 693
Coal economy of battleships engaged in blockade duty.—King.....x 1043

Coal endurance and machinery of the new cruisers.—Hollis .....iv 637
Coal endurance affected by expenditure for auxiliaries.....v 66
Coaler, auxiliary navy (see *Leonidas*).....x 536
Coal expenditure, *Charleston*, iv 683; for auxiliary machinery, iv 672; effect on economic speed.....v 66
Coaling at sea, Cunningham-Seaton proposed method.—Cunningham..xv 1057
Coaling buckets and tubs.....xiii 25
Coaling of warships.—Edwards, xiii 1; from ships in tow, xiii 35; in port, rapidity of.....xvi 944
Coaling, rapid, in British Navy, x 206; record, British battleship.....xiii 464
Coaling ship, Engineer Division duties.....xiii 934
Coaling ships at sea.....x 1154, xi 1049, xii 215, xiii 25, xiv 609, 280
Coaling stations, necessity of, xiii 21; New London, Conn.....xii 191
Coal production Alabama mines.....i 120
Coals, notes on.—Roelker: Chilean, i 70; Nanaimo, i 72; Pacific Coast, i 69; Sandy Point, i 71; Wellington.....i 71
Coals of Alabama.—Haines.....i 118
Coals of the Pacific Coast, notes on.—Roelker.....i 69
Coal-tar coatings for iron water pipes.....xi 931
Coast defense vessel *Monterey*, des.....i 176
Coast defense vessels (two) for Norway.....viii 635
Coatings for cast-iron water pipes.....xi 931
Coatings for metal, immersed in sea water, durability of.....x 781
Coatit, It., dimensions.....viii 199
Cobra, Br., disaster.....xiii 1033
Cochno, yacht, launch.....x 938
Code of 1899 for conducting steam boiler trials.....xii 37
Coetlogon, Fr., speed, iii 601; note and trials.....vi 618
Coffin's averaging instrument.....v 679
Coggeshall, R. C. P.—Tests of pumping engines and boilers, New Bedford, Mass., i 299; pumping-engine tests, New Bedford, Mass.....ii 26
Coke: Davis' foundry, analysis, vi 737; effects in cupola practice, x 1056; efficiency of, *Dolphin*.....vi 736
Coke ovens, waste gases from.....xii 227
Colaba, mer. str., trials.....vi 590
Colchester, mer. str., trials.....ii 340, iv 426
Colby, Albert Ladd.—Non-corrosive nickel-steel boiler tubes.....xvi 328
Cold-drawn boiler tubes, for naval purposes.....xv 421
Cold treatment of boiler tubes.....xv 425
Collapse, partial, of a corrugated furnace flue.....vii 131
Collapse of a pair of corrugated furnaces.....ix 394
Colliers for naval purposes.....xiii 39
Colliers (two), 12,000 tons, appropriation, 1904, *Erie* and *Ontario*...xvi 334
Collingwood, Br., des., i 265, 170; coal consumption, data, xiii 1029, 1031, 1032
Colomb, Admiral R. N.—Discussion, watertight doors.....viii 339
Colombia, U. S. of, gunboat for, des.....vii 841
Colonia, yacht, des.....v 998
Colorado, characteristics, xii 810; des. and trials.....xvi 996, 1118

Colossus, Br., coal consumption.....xiii 1029, 1031, 1032
Columbia, cruiser *No. 12*, authorization, ii 409; bids, ii 576; triple screws, iv 290; launch and des., iv 294, 513; trial, v 1034; des. and trials, vi 1; air-pump data, vi 532; boiler weights, iv 703; total number steam engines and cylinders, vi 33; run, Southampton to New York, vii 567, xii 736; damage by docking, report on, vii 569; steaming radius, xiii 56; comments on triple screws, xi 641; compared with *Good Hope*, Br.....xv 266
Columbia, mer. str., des., i 168, 361, iv 102, vi 162, 839, vii 439, xiv 693; first voyage.....i 269
Columbia, yacht, des., vi 220; launch, x 936; races.....xiii 809
Columbia, see *Wasp*.
Comanche, mer. str., launch and des.....viii 207
Comanche, see *Frolic*.
Combination boilers, systems.....xiv 920
Combined cylindrical and water-tube boilers, ships fitted with.....xiv 508
Combustion chambers and tube sheets for forced-draft boiler.....iv 787
Combustion chambers, separate and common.....iii 267
Combustion spaces of water-tube boilers.....x 727
Combustion: efficiency of, in marine boilers, etc., viii 764; in water-tube boilers, the problem of, and means of its solution, x 723; in marine boilers, viii 764; of coal, distribution of total heat of, iv 548; Orvis system of perfecting, iii 295; principles of, iv 268; spontaneous, of coal.....xii 1073
Combustion tester (Orsat), of the Italian battleship *Sicilia*.....viii 583
Comet, Ger., coal consumption and boiler data.....xiv 116
Commanche, yacht, des.....iv 326
Commerce, maritime, future of.....x 1104
Commerce on the Great Lakes.—Brock, Bureau of statistics.....v 153
Commonwealth, Br., data, xiii 770, xiv 1251; trials.....xvi 998
Communicating doors in bulkheads, dangers of.....viii 319
Communications, electric.....v 178
Compagnie Messageries Maritimes.—Report on Belleville and cylindrical boilers.....viii 151
Comparative cost of railway track in 1898 and 1899.....xii 213
Comparative data, *Wampanoag*, *Trenton*, and cruiser *No. 13*.....iv 737
Comparative thermal efficiency of steam engines and Diesel motors.—Meier.....xi 396
Comparative trials, *Medea*, *Medusa*, Br.....xvi 336
Comparative trials of boilers fitted with ordinary and with the "Serve" boiler tubes.....ii 569
Comparison of battleship designs, xiv 248; British and American naval vessels.....x 785
Comparison of mechanical drafts.—Thom.....viii 140
Comparison of new British cruisers with those building at Barrow, 1896, *Powerful*, *Niobe*, *Doris*.....viii 557
Comparison of single-cylinder and triple-expansion engines.—Isherwood.....v 271

Comparison of the hollow-bored method and the fluid-compression hollow-forged method of making steel forgings, x 1016; discussion—Porter.....x 1022
Comparison of the performances of the monitors *Arkansas*, *Florida*, *Nevada* and *Wyoming*.—Carney.....xv 823
Comparison of the propellers of some U. S. Navy ships.—Griffith.....iv 400
Comparison of the performances of Ward and Thornycroft boilers.....ii 581
Comparison of the Thompson, Tabor and Crosby indicators at about 800 revolutions.—Willis.....v 1025
Comparison of typical ocean steamers.....vi 162
Compartments and bilges, regulations on.....xvi 1202
Combined indicator cards of *Yorktown*.....i 268
Composite gauge glasses, Sholt and Gens'.....v 192
Compound dynamos, series field windings.....xii 178
Compound engines: cylinder ratios for, xi 118; Ashlin's high pressure, viii 157
Compound engine, Ericsson, and Belleville boiler.—Isherwood.....ii 445
Compound ingots, Cosgrave process of making.....xiii 463
Compound marine boilers.—Soliani, viii 477—discussion: Durston, 501; Yarrow, 505; Normand, 507; Thornycroft, 508; Robinson, 509; Thom, 509; Blechynden, 510; Lambert, 511; Wingfield, 514; Watkinson.....513
Compound steam turbines, application to marine propulsion.....ix 374
Compressed Air.—Book received.....iv 873
Compressed air: iv 777; explosions, x 193; for auxiliary machinery on board ship, iv 173; for ship central-power plants, x 95; machinery for lifting and hauling, iv 771; motor, weight and power of.....vi 582
Compressed-air system of forced draft.—Kutz, i 330—discussion: Kafer, 332; Bieg, 333; reply, Kutz.....334
Compressed-air transmission in factories and mills.....xii 403
Compression, data on.....xiii 422
Compression in cylinder clearance spaces, influence on steam consumption.....xii 315
Compression in steam cylinders, effect on economy.....xii 764
Compression of steam in the clearance space.....x 641
Compressor, 150-H.P., three-stage.....xii 1037
Compressors, air, efficiency of, x 1034; Duplex, *Terror* and monitors.....ix 16
Conant, Frank Henry, P. A. Engr., U. S. N.—Indicator tests, iii 322; obituary.....x 1233
Concerning tube cleaners.....xvi 1280
Conclusions and recommendations of the Admiralty Committee to consider existing types and designs of propelling machinery and boilers in Her Majesty's ships.....v 586
Concord, authorization and data, i 236; des. and trials, ii 578, iii 89; engine data, iii 422; boiler data, iii 422; propeller data, iv 158, 402; work on, ii 417; coal consumption, iv 110; coal endurance, iv 661; boiler weights, iv 703; air-pump data, vi 532; test of evaporators, i 291; power of auxiliary machinery, iii 217; bursting of main steam pipe, iii 399; repairing a broken valve chest, vi 761; steaming radius.....xiii 56
Concord, *Bennington*, *Yorktown*, trial results compared.....iii 216

Condé, Fr., data, xiii 497; launch, xiv 663; defects in, xvi 698; trials.....xvi 1010
Condé and *Gloire*, Fr., trials.....xvi 354
Condemned vessels, sale of.....xii 240
Condensation in, and jacketing of, cylinders of triple-expansion engines.....iv 486
Condensation of steam, x 200; in cylinders, glass revealer.....xii 998
Condenser and evaporator, Ericsson's, report on.....xi 82
Condenser and evaporator, test of, 1847.....xiii 343
Condensers, increasing vacuum in, xvi 948; in warships, xiv 530; with turbines.....xvi 176
Condenser tubes, xv 202; deterioration of, *Baltimore*, iv 114; experiments, Yarrow.....xiv 535
Condensing steam turbines, Westinghouse-Parsons.....xiii 136
Conditions, of warship trials, Br., xvi 1285; standard, of trials.....iv 598
Condor, Br., dimensions, ix 804; trials.....xii 564, xiii 274
Condor, Ger., coal-consumption and boiler data.....xiv 116
Condor, It., progressive trials.....xii 77
Confidence, see *Wabau*.
Conflict, Br., machinery, viii 621; speed.....x 860
Congo, mer. str., trials.....vi 590
Congreso, Chili, data.....ix 406
Connecticut, Act of Congress, x 813; bids, x 1169, xiv 1233; des., xiv 935; launch and des.....xvi 1308
Connecting rod, angularity and weight of reciprocating parts, method for determining.....i 271
Connecting-rod and crosshead valve gears.....iii 544, 549
Connecting-rod bearings, position of oil holes.....ix 119, 121
Connecting rod, centrifugal action, determining and counterbalancing..ii 433
Connecting rods, obliquity of in valve diagrams, graphic method of considering.....v 991
Connectiug-rod pressures, German naval vessels, three and four cylinder engines.....xiv 21
Conqueror, Br., des., i 265, 170; boiler data.....iv 507
Conquests of the American engineer.....x 1158
Construction and design of German men-of-war, development in.....viii 543
Construction, details of, and arrangement of marine machinery.....xiv 1
Construction, installation and performance of the electric-lighting plant at the Government Hospital for the Insane, Washington, D. C.—Baird.....ix 237
Construction of boilers adapted to forced draft.—Yarrow, iii 229; discussion, iii 236; marine boiler, v 890; Niclausse boiler, details of.....xiii 377
Construction of warships, effect of battle of Yalu on.....viii 370
Construction Practique des Navires de Guerre, Book received.....ix 450
Construction, speed of, a vital factor of naval strength.....x 150
Constructive development of the Dürr boiler in the German Navy.—Von Buchholtz.....xiii 881
Constitucion, Chile, see *Swiftsure*, Br.

Constitution, yacht, des.....xiii 545
Contest, Br., des. and trials.....vii 424
Contest for the *America's* cup, 1893.....v 998
Continuous-current dynamos and motors.—Cox, Book received.....v 1097
Continuous-current dynamos, design of.....ii 308
Continuous record of performance of a marine engine, method of determining.....ix 1
Contraction of area in tests of steel as a proof of quality.....iv 764
Contract trials.
U. S. sea-going battleship *Alabama*.—Hall.....xii 855
U. S. protected cruiser *Albany*.—Norton-Gillmor.....xii 281
U. S. gunboat *Annapolis*.—Mathews.....ix 560
Full-power forced-draft, U. S. S. *Baltimore*.—Norton-McFarland.....i 337
U. S. S. *Bancroft*.—Griffin.....v 365
Full-power forced-draft, *Bennington*.—Moritz.....iii 206
Torpedo boat *No. 27*, *Blakely*.....xvi 1076
U. S. armored cruiser *Brooklyn*.—Herbert.....viii 741
Full-power forced-draft, U. S. S. *Concord*.—Hine.....iii 89
Torpedo-boat destroyer *Decatur*.—Webster.....xiv 57
Torpedo boat *No. 28*, the *DeLong*.—Kaemmerling.....xiv 825
U. S. torpedo boat *Foote*.—Offley.....ix 655
Gresham, U. S. R. C. S.—McAllister.....ix 253
U. S. gunboats *Helena* and *Wilmington*.—Smith.....ix 360
U. S. sea-going battleship *Illinois*.—Pickrell.....xiii 559
United States coast-line battleship *Indiana*.—Hall.....vii 637
United States sea-going battleship *Iowa*.—Pickrell.....ix 453
U. S. torpedo-boat destroyers *Lawrence* and *Macdonough*.—Ball.....xv 667
And screw trials U. S. S. *Katahdin*.—Bieg.....viii 1
U. S. sea-going battleship *Kearsarge*.—Price.....xi 823
U. S. battleship *Kentucky*.—Webster.....xii 1
U. S. gunboats *Machias* and *Castine*.—Barton-Denig.....v 846
U. S. armored cruiser *Maine*.—Morley.....vii 1
U. S. revenue cutters *Manning* and *McCulloch*.—McAllister.....ix 711
U. S. S. *Marblehead*.—Carr.....vi 129
United States coast-line battleship *Massachusetts*.—Hayes.....viii 237
U. S. triple-screw protected cruiser *Minneapolis*.—Willits.....vi 702
U. S. S. *Monterey*.—Gage-Theiss.....v 115
U. S. S. *Nashville*.—Smith-Price.....ix 574
U. S. monitor *Nevada*.—Newell.....xv 105
U. S. S. *Newark*.—Miner.....iii 99
U. S. S. *New York*.—Freeman-Anderson.....v 613
Olympia.—Carney.....vi 241
United States coast-line battleship *Oregon*.—Morgan.....viii 439
Torpedo-boat destroyers *Paul Jones*, *Perry* and *Preble*.....xiv 773
U. S. S. *Philadelphia*.—Chambers.....ii 524
U. S. S. *San Francisco*.—Warburton.....ii 537
Torpedo boats *Shubrick* and *Thornton*.—Webster.....xiii 586
Speed, of U. S. torpedo-boat destroyer *Stewart*.—Moritz.....xv 111

Contract trials.
Machinery of the *Texas*.—Kinkaid.....viii 82
U. S. gunboats *Vicksburg* and *Newport*.—Stevenson.....ix 549
U. S. gunboats *Wheeling* and *Marietta*.—Bieg.....ix 641
U. S. torpedo boat *Wilkes*.—Moritz.....xiv 856
U. S. battleship *Wisconsin*.—Robison.....xii 979
U. S. S. *Wyoming*.—Bush.....xv 83
Full-power, forced-draft, U. S. S. *Yorktown*.—McFarland-Norton.....i 137
Contracts with private builders for machinery for French naval vessels.....iv 480
Conversions and re-armaments of ships on the effective list.—Brassey, xiii 617; discussion: Fremantle, xiii 622; Barnaby, 624; Biles, 625; Bowden-Smith, 627; Elgar, 628; Hay, 629; Thornycroft, 629; Hopkins, 629
Converted marine engines.....iv 780
Converters, rotary, metallic brushes for.....xii 496
Conveyor.—Temperley.....xiii 17
Coosa coals, Alabama.....i 121
Cooley, Prof. Mortimer E.—New engineering buildings, University of Michigan.....xv 908
Cooling machines, new wrinkle in.....xi 774
Cooling rolled bars.....xii 227
Cooper, Theodore.—Specifications.....v 559
Copeland, Charles W.—Obituary.....vii 201
Copper alloys, endurance in sea water.....xi 336
Copper and its alloys, foundry practice.—Reardon.....xvi 960
Copper: boiler tubes changed to steel in British destroyers, vii 424; deposits, Alaska, xiii 180; effect of impurities on, xvi 981; exhaust pipe, collapse of, xi 697; exports for 1900, xiii 179; influence on steel rails and plates, xiii 678; ingot, xvi 979; pipe, defects in, xi 696, xii 134; pipes, brazed, strength of, i 208; pipes, wound, test, vii 510; piping, standard dimensions, iii 421; steam and water pipes, standard dimensions, iii 421; sheathing, galvanic action of, xii 1061; steam pipes, brazed, x 510; steam pipes, defects and their causes, v 348; steam pipes, bursting of on *Elbe* and *Lohn*, iii 410; steam pipes, main, bursting of *Concord's*, iii 399; steam pipes, remarks on, vii 522; steel, iii 504; tempered and untempered, iii 498; tubes, electrolytic, xii 501; tubing, method of manufacture, xv 197; zinc, iron alloys.....iii 493
Copying process, simple.....xi 774
Coquette, Br., speed.....xi 1103
Coralia, mer. str., dimensions and launch.....viii 426
Corcovado, mer. str., launch, des. and trial.....viii 865
Cordillère, mer. str., Belleville boilers.....viii 153
Corliss boilers, test of.....i 299
Cormoran, Ger., coal-consumption and boiler data.....xiv 116
Cornwall, Br., engines of.....xvi 684
Cornwallis, Br., launch and data, xiii 717, 1110; trials.....xvi 258, 260
Corn-pith, cellulose.....x 1160
Correct treatment of steel.—Ridsdale.....xiv 138

Corrientes, Arg. Rep., des., viii 383; launch, viii 805; trials.....ix 140
Corrosion and pitting of boilers.....iv 689, vi 673
Corrosion: deterioration of steel vessels from, xiv 599; marine boilers, preservation of, iii 179; of boilers by magnesium chloride, xiv 1214; of boiler tubes, xiv 510; of boiler tubes.—Ford, xvi 529; of boiler tubes in U. S. Navy.—Worthington, xii 587, 907, xiii 333, 822; of boiler tubes, menace to naval efficiency, xv 419; of boiler tubes, nickle and mild-steel, test, xi 634; of boiler tubes, reasons for, xii 588; of copper alloys in sea water, xi 338; of iron, xii 1060; of steel boiler tubes, rapid, reasons for, vii 413; of steel vessels, iv 699; protection of iron from, xi 448; relative, of various metals, xi 1044; water-tube boilers...vii 116, x 627
Corrugated furnace flue, partial collapse of.....vii 131
Corrugated furnaces, collapse of, ix 394; Fox's formulae, iv 257; tests of Brown's improved type.—Eaton.....xv 182
Corsair, see *Gloucester*.
Corsaire, Fr., torpedo boat, ordered.....iv 520
Corwin, data.....x 534
Coryell, Miers.—Tubulous boilers, the Belleville boiler.....ii 206, 371, 555
Cosgrave process of making compound ingots.....xiii 463
Cosmao, Fr., speed.....iii 601
Cost: annual, of battleships during commission, vi 168; auxiliary machinery on shipboard, iv 194; certain vessels for French navy, iv 521; cheap men, xi 1042; electrical propulsion for torpedo boats, xi 64; electric light, *Albatross*, vi 516; French naval vessels, 1898, x 257; liquid air, xi 724; *Manola*, mer. str., season 1890, operation of, v 151; power, increased per unit at low power, vi 684; recent battleships *Royal Sovereign*, *Centurion*, *Barfleur* compared, vi 495; steel castings, i 185, iv 89; transportation on the lakes, x 734; warships, effect of accessories on, xv 350; warships in England and France.....xii 181
Cotton-mill engine, economy test of.....x 665
Counterbalancing centrifugal action of connecting rod by graphic method.....ii 433
County Class, Br., compared to *Prinz Heinrich*, Ger., xiv 334; coal consumption.....xvi 262
County of York, mer. str., data of quadruple-expansion engines.....i 79
Courbet, Fr., des.....xiv 664
Covers: flat, cylinder, manhole, valve-chest, etc., resistance and distortion of.....x 660
Coverings for steam-heated surfaces.....x 708
Cowles boiler, comparative test with Ward boiler.....ii 414
Cowles, Wm.—Discussion, tubulous boilers, ii 204; discussion: "Some Lessons from Samoa".....i 215
Cox, Irving.—American steam yachts.....x 393
Coyle, C. G., see *Choctaw*.
Craigleith, mer. str., des.....xi 541
Craig's combustion tester.....viii 587
Cramp's floating derrick.....v 477
Cramp, Wm., & Sons.—Contract for *Mississippi*.....xvi 37

Crane, Br., launch, ix 174; trials.....x 225
Cranes: electric, 150-ton, Newport News shipyard, xi 173; large pillar, v 193; locomotive, vi 147; modern, v 921, vi 147; shipbuilding works.....xiii 959
Crank, R. K., Lt., U. S. N.—Report of a six-day trial of the Lillie multiple-effect distilling plant at Dry Tortugas, January 13 to 20, 1900, xii 85; latest type of Babcock & Wilcox marine boiler.....xvi 1223
Crank pins: dimensions, ix 78–80; and axles, nickel-steel for, x 474; fractured, *Lubeck*, mer. str., iii 456; walking beam counterbalance for turning.....xiv 527
Crank sequence, German naval vessels.....xiv 18
Crank web dimensions.....ix 81
Crank-shaft bearings, position of oil holes.....ix 120
Crank shaft, broken, *Trave*, mer. str.....v 188
Crank-shaft forgings, *Petrel's*, iii 3; steel.....iii 1
Crank shafts: advantages of built-up over solid-forged, i 134; application of formulae for turning effort, vi 334; fitting up *Newark's*, iii 9; paper on.—McAlpine, viii 665; solid, fitting up.....iii 328
Craven, *T. A. M.*, torpedo boat *No. 10*, full data, x 818, xiii 1082; speed.....xii 241
Craven and *Dalgren* in collision.....xii 1097
Creole, see *Solace*.
Creole, mer. str., launch and des., viii 857; speed.....ix 197
Crescent, Br., des., iii 134; details, v 226; machinery, v 746; trials, v 747; speed, vi 616; coal consumption, vii 415; machinery data, xi 330; machinery space, xiii 867; voyage to Australia.....vi 616
Crescent City, mer. str., launch.....ix 198
"Crescent" high-speed engines.....ix 696
Cressy, Br., des., xii 242; trial.....xiii 274, 277
Cressy class, Br., new armored cruisers, x 540; data.....xi 242
Crète-à-Pierrot, Hayti, launch and des.....viii 193
Cristobal Colon, Span., launch and des., viii 854; des.....x 586
Criticism on torpedo boats, English maneuvers, 1888.....i 169
Crockett, C. W.—Amsler's polar planimeter.....v 665
Croiseurs corsaires, French, des.....vii 602, 825
Croll, D.—Working engines at low power.....vi 592
Crompton.—Discussion, determination of the dryness of steam.....vii 320
Croneau, A.—Architecture navale.....vi 844
Crosby indicators compared with Thompson and Tabor.....v 1025
Crosshead and connecting-rod valve gears.....iii 549
Crowe mechanical stokers.....xii 901
Crown Point, mer. str., launch.....xii 269
Cruisers: *A*, Ger., data, xi 1110; *B*, Ger., Dürr boilers, xiii 897; *M* and *N*, Ger., triple-screw, viii 631; *No. 6*, des., ii 230; bids, ii 408; work on, iv 293; *Nos. 7* and *8*, *Cincinnati* and *Raleigh*, 3,000 ton, des., i 349; machinery for, ii 416; *Nos. 9, 10, 11*, *Detroit*, *Montgomery*, *Marblehead*, 2,000-ton, des. and bids, i 350; des. and authorization, i 253; *No. 9*, *Montgomery*, work on, ii 417; launch, iv 117; *No. 10*, *Detroit*, work

on, ii 417; named, iii 595; launch, iv 117; *No. 11*, work on, ii 417, iv 294; and *Maine* (old), failures of steel castings, iv 83; *Nos. 12* and *13*, *Columbia* and *Minneapolis*, triple-screw, iv 290; work on, iv 294; *No. 13*, bids, iii 459; *No. 13*, *Trenton* and *Wampanoag*, comparative data, iv 737; *Nos. 14* to *19*, dimensions, xi 779; British and their coal supply, iv 796; fleet scouts, Br., vi 804; new, Br., (1896–97), viii 378; Chinese, new (three), viii 612; French, armored, discussion of, xvi 700; French, Mediterranean squadron, defects in, iv 313; French, recent unsatisfactory trials of (1895), vii 150; squadron, Br., run of, xvi 692; new British, Barrow-built, compared with *Powerful*, *Niobe*, *Doris*, viii 557; economy of, xvi 1202; function and design of, xvi 1274; Italian, new (two, 1896), viii 410; Portugal, new (1896), viii 420, 851; new, coal endurance and machinery of, actual sea performance, iv 637; torpedo, authorization, ii 409; des.....ii 411

Cruising, extra cylinder for use in.....v 98

Crush, William.—Development of the Yarrow boiler for use in battleships.....xv 834

Cryolite of Greenland.....xiii 185

Crystalline structure of metals.....x 966

Crystallization and segregation of cast iron.....xi 1001

Crystallography and micro examination of metals.....x 967

Culgoa, steaming radius.....xiii 56

Cumberland, Br., trials.....xvi 258

Cumberland coals, comparative tests.....i 123

Cummins, W. R.—High pressure at sea, with some considerations of types of boilers.....x 1079

Cunard steamer *Campania*.....v 385

Cunard turbine commission, report of.....xvi 634

Cunard turbine vessels.....xvi 634

Cunningham, A. C., Civil Engineer, U. S. N.—The Cavite steel floating drydock, xv 472; coaling at sea, the Cunningham-Seaton proposed method.....xv 1057

Cupola practice, modern.....x 1045

Cup defenders.....v 650

Cup races (1893) for the *America's* cup.....v 998

Curacoa, mer. str., des.....viii 204

Curlew, Br., des.....i 264

Current and voltage for electric-power transmission.....xiv 819, 1117

Currents, wake, on the measurement of.....v 869

Curry, mer. str., des.....v 761

Curtis steam turbines, ix 785, xvi 221; water consumption.....xvi 223

Curves.

Adder, progressive trial, xv 45; *Adder* and *Moccasin*, storage-battery discharge, xv 55; air-lubricated journals, pressure, friction, etc, ix 282; air-pump efficiency, vi 532; *Alabama*, speed, revolutions, power, etc., progressive trials, xiv 192; *Almy*, yacht, progressive trials, iv 132; analysis of, v 551, 553, 544, 555, 556; angularity of connecting rod and weight of reciprocating parts, i 284; Atlantic liners, speed, cargo, displacement.....xiv 1199

Curves.
Bancroft, progressive trials, speed, revolutions and I.H.P., v 208, 378, 384; *Bainbridge*, *Barry*, *Chauncey*, speed and revolution, xiv 1023; battleships, British, oscillation, vii 560; battleships, coal consumption and speed, xv 371; boiler efficiencies.....xvi 165
Centrifugal fans, data of tests, ix 314; *Charleston* blowers, power, iv 680; circulating pump, power, iv 676; coal consumption, v 75, 76; power and speed, cruising, iv 683; *Cincinnati* and *Raleigh*, *Maine* (old), *Monterey*, *Texas*, *Monadnock*, speed, iii 556; *City of Paris*, crank effort, vi 320; *Cleveland*, contractor's progressive trials, xv 1122; *Colorado*, power and speed, xvi 1120; comparative evaporation of boiler tubes at varying angles, viii 488; compression of steam in the clearance space, x 656; *Condor*, It., speed and power, xii 82; cooling curve of steel from its liquid state, x 477; crank effort, *Baltimore*, i 348; *Charleston* (old), i 328; *Yorktown*, i 147; crank shafts, dimensions, viii 712; bearings, journals, pins and webs, ix 78; shearing stresses, ix 348, ix 487; Curtis turbine, water consumption....xvi 223
Daring, Br., speed and slip, vii 736; De Laval nozzle, velocity of flow, xiii 119; pressure, xiii 120; *De Long*, progressive trial, xiv 844; *Detroit* and class, coal-speed, xv 377; *Diadem*, Br., speed, x 569; *Dixie*, coal-speed, xv 374; *Dolphin*, air pump, power.....vii 135
Economical speed of ships, xiii 664; Edison storage battery discharge, xiii 676; electric motors, efficiency, xii 407; electric transmission, efficiency, xii 405; *El Primero*, speed and power, v 1092; engine and dynamo efficiency, xii 408; engine moments, vi 344; evaporative tests, Yarrow boiler, x 409; evaporators, output.....vii 502
Fall of temperature in cylinder, xii 1000; floating drydocks, stability, xv 16; four-cylinder marine engine, piston-rod effort from indicator cards, xiv 124; four-cylinder marine engine, unbalanced moments, xiv 126, 128, 130; *Friant*, Fr., trial.....viii 376
Goldsborough, revolution, speed, xv 784; *Grampus*, speed, revolutions and slip.....xv 592
High-speed engines, water consumption and efficiency, ix 706; *Hopkins* and *Hull*, speed-power, speed-revolutions, slip and steam-revolutions.....xv 730
Increased piston speeds and steam pressures, 1800-1900, xii 136; induction motor, efficiency and power, xii 414; *Iona*, mer. str., trials.....iii 392
Kearsarge, speed, revolutions, power, etc., progressive trials.....xiv 192
Lawrence, power-revolutions, xv 688; *Lawrence* and *Macdonough*, speed-revolutions, xv 690; light-draught steam launch, speed and power trials.....x 191
Maine, progressive-trial results, xvi 528; speed-revolutions, xiv 1140; *Marietta* and *Wheeling*, x 94; *Massachusetts*, speed, revolutions, power, etc., progressive trials, xiv 192; *Massachusetts* and *Indiana*, coal-speed, xv 375; mean effective pressures from calibration tests for continuous record of marine engines, ix 12; *Moccasin*, progressive trials, xv 44; motors, synchronous, induction and direct-current, efficiencies.....xii 418

Curves.
Newark, inertia stress of valve gear, xii 691, 701; *New York*, coal-speed.....xv 368
On economic marine propulsion, iii 220; outflow volume of steam, xvi 576, 586
Paul Jones, *Perry*, *Preble*, progressive trials, xiv 804; performance, type "C" motor, 200-H.P., xiii 1001; *Pike*, speed, revolutions and slip, xv 589; *Plunger*, speed, revolutions, xv 860; power for marine propulsion, viii 318; progressive trials, revolutions and power on speed, speed and power on revolutions, iv 602; efficiency, iv 80; indicated thrust, xv 330; Spezia tank experiments, xv 1105; propellers, trials of screws, yacht *Ethel*, v 307; *Protector*, battery performance.....xv 1226
Raleigh, speed, viii 302; righting moment, *Royal Sovereign*, *Monarch*, *Devastation*.....vi 492
San Francisco, coal-speed, xv 380; screw propellers, relations of functions, xv 282; shafts, equivalent hollow and solid, vii, 508; shallow-draft launch, speed and power, xiv 1213; *Shark*, speed-revolutions, xv 872; *Shubrick* and *Thornton*, trial data, speed, etc., xiii 604; slide valve, vi 280; speed, twin and triple-screw battleships, 12,500 tons, xi 683; speed, twin and triple-screw cruisers, 11,000 tons, xi 684; stability, *Royal Sovereign*, *Monarch*, *Devastation*, vi 476; steam-cutter engines, efficiency, xiv 38, 40; steam turbines, Westinghouse–Parsons, efficiency, xiii 135; storage batteries, time of discharge, xi 55, 56, 57; stresses of elastic gears, xii 337, 604, 610, 615, 645, 653, 658, 666, 671; *Sunderland*, Br., trial, vi 270; superheat corrections, coefficients for, and B. T. U.'s per minute per I.H.P., xi 964; synchronous motor efficiency, real and apparent...xii 417
Tacoma, speed-revolution, xvi 20; torsional vibrations of shafting, *Besoeki*, mer. str., xiv 727; torsional vibrations of shafting, crank effort, xiv 734; turning moment, xiv 747; turning moment, crank shafts, viii 680, ix 48, ix 348, ix 510; turbines, steam, Westinghouse, economy test.....xv 1253
Umbria, mer. str., trials, vi 270; unbalanced pressure in cylinders, vi 344; velocity for steam-engine valve ports.....xvi 598, 611
Wake coefficients, xv 287, 289, 291, 295, 297, 303, 313, 316, 326, 328; *Wilkes*, progressive trials, xiv 864; *Worden*, speed, revolutions and power, xv 401, 402; *Wyoming*, speed and revolutions.....xv 99
Yarrow-Schlick-Tweedy system of balancing engines, x 484; *Yorktown*, economical qualities.....iv 671
Curves, analysis of, in engineering investigations.....v 543
Curves, coal consumption and speed.....xv 366
Curves, methods of plotting for progressive trials.....iv 587
Curves, non-algebraic, for maxima and minima, treatment of, by use of ordinates.....iv 71
Curves, speed, of naval vessels.....iii 555
Curves showing the relation between equivalent hollow and solid shafts.—Durand.....vii 507

Cushing, launch and des., ii 127; machinery, ii 215; engine vibrations, iii 16; trials, ii 221, iii 459; and its experiments investigated, des. and trials, iv 1; des. and contract trials, iv 43; data, vi 652, x 818; full data, xiii 1082; propeller data, iv 158, 402; boiler weights, iv 703; boilers, performance and data, xvi 153, 163; Thornycroft boiler trials, ii 580, vi 683; compared with *Ericsson*, vii 572; steaming radius.....xiii 56
Cyclone, Fr., note.....viii 850
Cyclops, Br., des.....i 266
Cylinder clearances, see clearances, cylinder.
Cylinders: Arrangement for full power and for cruising, v 98; balance, assistant, xvi 896; casting, method of molding in dry sand, iv 159; condensation, amount of in jacketed triple-expansion engines, iv 486; engine, steam-jacket efficiency, iii 422; large, jacketing of barrels not advised, v 81; molding in loam and casting, *Cincinnati* and *Raleigh*, iv 376; ratios, British cruisers, viii 566; for compound engines.—Rockwood, xi 118; German naval vessels, xiv 18; steam, effect of compression on economy, xii 764; glass revealer for studying condensation, xii 998; and engines, list, *Brooklyn*, viii 761; *Columbia*, vi 33; *Indiana*, vii 662; *Iowa*, ix 478; *Kentucky*, xii 20; *Maine* (old), vii 28; *Massachusetts*, viii 265; *New York*, v 68; *Oregon*.....viii 470
Cylinder covers, flat, resistance and distortion of.....x 660
Cylinder diameters, formula for in successive expansion engines.....i 147
Cylindrical and water-tube boilers, compared, vi 373; *Dido*, *Othello*, *Zero* vs. *Cameo* and *Hero*, Babcock & Wilcox.....ix 673
Cylindrical boiler features combined with water-tube, for marine purposes.....viii 477
Cylindrical boilers, advantages of, viii 477; formulae for strength of seams, stays and braces.....viii 269
Cylindrical heads for steam boilers, development of.....iii 221
Cylindrical vs. Belleville boilers, *Minerva*, *Hyacinth*, Br., trials, xiv 458; vs. water-tube boilers, vi 373; vs. water-tube boilers for naval vessels.....xv 924
Cymric, mer. str., launch.....ix 834

D

D2 and *D3*, Fr., triple-screw cruisers, dimensions.....ix 176
Dade, F. C., Chief Engineer, U. S. N. (retired).—Obituary.....xiv 715
Dahlgren, torpedo boat *No. 9*, data, x 818; xiii 818; launch and des., xi 781; trial.....xi 1083
Dahlgren and *Craven* in collision.....xii 1097
Daimler, yacht, data.....x 938
Dakota, mer. str., Niclausse boilers, xv 1163; launch.....xvi 707
Dale, named, x 818; launch, xii 822; full data, xiii 1082; trials, xiv 947; note.....xiv 614
D'Allest, Belleville, Niclausse boilers, compared in *Chasseloup-Laubat*, *Bugeaud*, *Friant*, Fr.....vii 408

D'Allest boilers, iv 103; *Bouvines*, Fr., vii 402; *Carnot*, Fr., vii 385; in navies, xvi 292; tests, vi 368; description and management.....vii 365
D'Allest, Jules.—Discussion, water-tube boilers a necessity.....xi 25
Danger from electric sparks.....xi 1079
Dangers from oil fuel.....xiii 469
Danube, mer. str., des.....vi 634
Daphne, Br., trials.....i 86
Dard and *Baliste*, Fr., trials.....xvi 700
Daring, Br., launch, vi 204; des., vi 605; trials, vi 611, xi 328; cavitation of propellers, vii 746, ix 678; discussion and data, vii 713; explosion, xiii 733
Daring type, Thornycroft boilers.....vi 156, vii 346, 363
Darlington (Pa.), coal tests.....xi 97
Dasher, Br., trials.....xi 328
D'Assas, Fr., dimensions, vi 204; launch, viii 404; data, ix 425; trials, x 575; repairs.....x 886
Data of some quadruple-expansion engines and their performances.—Bieg.....i 77
Data on compression.—Mattison.....xiii 422
Davis, torpedo boat *No. 12*, full data, x 818, xiii 1082; trials, xi 237, 892; boiler accident.....x 1175
Davis, Chas. H.—Discussion, electric lighting of ships.....iii 522
Davison, G. C., Lieut. U. S. N.—Care of torpedo boats in reserve.....xv 756
Davidson pump valve gear.....ix 385
Davout, Fr., characteristics, iii 142; compared to *Suchet*, Fr., iii 272; repairs to, iii 600; defects in.....iv 314
Deadman, H. E.—Application of electricity in royal dockyards.....v 178
Dean, F. W.—Duty trial of a Blake high-duty pumping engine, at the City Water Works, Newton, Mass.....v 465
Decatur, named, x 818; full data, xiii 1082; contract trial.....xiv 57
Decidée, Fr., data, ix 810; trials.....xii 839
Decoy, Br., trials, vi 804; loss of.....xvi 1327
Deepest ocean temperatures.....xii 526
Dedication of a bronze bust of Chief Engr. Isherwood, U. S. N.....x 440
Defects of steel and their causes.....xiv 178
Defective boilers in English war vessels.....iv 103
Defective castings, steel.....i 202
Defense of the Niclausse boiler.—J. & A. Niclausse.....xiv 485
Deflection of tubes.....xi 491
De Laval steam turbines.....x 211, xiii 114, xvi 214
De Laval nozzles for steam turbines.....xvi 197, 214
De Laval centrifugal power pumps.....xvi 547
Delfin, Nor., dimensions.....ix 432
Delfino, It., trials.....xiii 1117
De Long, named, x 818; full data, xiii 240, 1082; contract standardization trial.....xiv 825
Delphin, Rus., data.....xi 532
Delta metal, iii 124, 493; tests.....v 717
Delta white anti-friction metal.....v 717

Démocratie, Fr., work on, xvi 348; launch and des.....xvi 695
Denig, R. G., P. A. Engr., U. S. N.—The contract trials of the U. S. gunboats *Machias* and *Castine*.....v 846
Denmark shipbuilding.....xi 1039
Denny, Archibald.—Discussion, speed trials of fast ships, ii 333; discussion, the marine steam turbine.....xiii 437
Dense-air ice machine, Allen.....iv 771
Denton, Prof. J. E.—The reliability of "throttling calorimeters," viii 98; centrifugal pump tests.....xvi 547
D'Entrecasteaux, Fr., des., v. 751; launch, viii 626; des. and trials.....x 885
Denver, data, xi 508, 1081, xiv 357; launch, xiv 947; builders' trial, xvi 90; gen. des., official trial.—Naumann, xvi 67; new propellers, second trial, xvi 613; second official trial.—Alexander.....xvi 612.
Denver, mer. str., launch and dimensions, xiii 537; des.....xiii 1138
Deoxidized bronze.....iii 497
Deposits, boiler.....iii 243
Deposition of smoke, electrical.....xiii 217
Depth of water, effect on speeds of ships.....iv 281, 329
Depth of water for trial course.....iv 601
Derrick, floating, at Cramps.....v 477
Desaix, Fr., launch and data, xiii 497; dimensions, x 886; trials.....xvi 351
Descartes, Fr., des., v 519; des. and launch, vi 805; trial, viii 626; alterations.....viii 849
Description and trials of the U. S. Monitor *Arkansas*.—Mallory.....xiv 1172
Description and trials of the U. S. torpedo-boat destroyers *Hopkins* and *Hull*.—Macalpine-Layman.....xv 694
Description and trials of U. S. destroyers *Truxtun*, *Whipple* and *Worden*.—Ford.....xiv 1083
Description of experiments made at Messrs. Yarrow & Co.'s works, Poplar, January, 1896.....viii 133
Description of the lifting and hauling appliances in Portsmouth dockyard.....iv 777
Description of the steam-engineering plant at the Navy Yard, N. Y.—Matthews.....xiii 872
Description of walking-beam counterbalance as used in the steam engineering shops of the Mare Island Navy Yard for turning launch crank pins.—Dixon.....xiv 527
Design and construction of German men-of-war, development in.....viii 543
Design and testing of centrifugal fans.—Heenan-Gilbert.....ix 293
Design for a fast scout.—Fitzgerald, xiii 412; discussion: Clover, xiii 416; Hopkins, 416; May, 417; White, 418; Watts, 418; Biles, 419; reply to discussion.....420
Designing continuous-current dynamo machines.—Jamieson.....ii 308
Designs for new battleships, 1901.....xiii 734
Des Moines, data, xi 508, 1081; launch and des., xiv 1233; general des. and official trials.....xvi 227
Desperate, Br., des., viii 182; launch and trials viii 399; accident to, viii 621; trials.....viii 842

Destroyers.
Angler, Br., launch, ix 400; trials, x 858; *Akatsuki*, Jap., trials, xiv 343; *Akebono*, Jap., des., xi 803, xii 257; *Albatross*, Br., note, viii 622; data, ix 420; trials, xiii 271; *Ardent*, Br., des. and trial, vii 168; trials, xi 328; Argentine Republic (four), viii 383; *Ariel*, Br., launch, ix 420; *Arun*, Br., trials, xvi 259; *Asashio*, Jap., launch, xiv 343; trial, xiv 677; as scouts, xvi 670; *Audaz*, Sp., dimensions, ix 192; launch.....ix 438
Bainbridge, named, x 817; launch, xiii 769; full data, xiii 1082; data, xiii 1085; contract and standardization trial, xiv 1003; failure of forced-draft blowers, xiv 296; *Baliste*, Fr., trials, xvi 700, 1011; *Banshee*, Br., des. and trial, vii 424; Barnaby, on strength of, xiv 396; *Barry*, named, x 817; launch, xiv 613; full data, xiii 1082; contract and standardization trial, xiv 1003; *Bat*, Br., trials, ix 806; speed, ix 420; boiler explosion, xii 567; bids for sixteen for U. S. Navy, x 1173; *Bittern*, Br., launch, ix 421; *Blackwater*, Br., trials, xvi 259; *Boxer*, Br., des. and trials, vii 169; *Boyne*, Br., launch, xvi 1326; *Brazen*, Br., launch, viii 621; trials, xiii 271; *Bruiser*, Br., launch and des., vii 419; British, vii 796; new requirements for trials of, viii 399; new, ix 809; trials, xiv 46; testing, xiv 931; bilge keels, xiv 931; *Bullfinch*, Br., trials.....xiii 271, xiv 208
Comparisons and cost, xvi 950; comparison of five, Thornycroft, vii 422; trials and comparisons, xvi 259, 264; water-tube boilers in, vii 797; *Casabianca*, Fr., vi 206; *Capitan Muniz Gamero*, Chili, launch, viii 386; speed, viii 807; *Capitan Orella*, Chili, launch, viii 386; trials, viii 807; ordered, vii 811; *Chamois*, Br., launch, ix 174; trials, ix 805; loss of, xvi 1327; *Charger*, Br., trials, xi 328; *Chauncey*, named, x 818; launch, xiii 1085; full data, xiii 1082; contract and standardization trial, xiv 1003; *Cheerful*, Br., launch, ix 808; speed, x 1196, xi 1101; *Cherwell*, Br., trials, xvi 690; Chili, four ordered, vii 811; China (four, 1899), xi 238; *Conflict*, Br., machinery, viii 621; speed, x 860; *Coquette*, Br., speed, xi 1103; *Corrientes*, Arg. Rep., trials, ix 140; *Contest*, Br., des. and trials, vii 424; *Crane*, Br., launch, ix 174; trials, x 225; *Craven* and *Dahlgren* in collision.....xii 1097
Dale, named, x 818; launch, xii 822; full data, xiii 1082; trials, xiv 947; note, xiv 614; *Dard*, Fr., trials, xvi 700; *Daring*, Br., launch, vi 204; des., vi 605; trials, vi 611; discussion and data, vii 713; trials, xi 328; explosion, xiii 733; *Dasher*, Br., trials, xi 328; *Decatur*, named, x 818; full data, xiii 1082; contract trial, xiv 57; *Decoy*, Br., trials, vi 804; loss of, xvi 1327; *Desperate*, Br., des., viii 182; launch and trial, viii 399; accident to, viii 621; trial, viii 842; *Doone*, Br., launch, xvi 1326; *Dove*, Br., trials, xiii 271; *Dragon*, Br., des. and trials, vii 424; *Dunois*, Fr., dimensions, viii 190; data.....ix 813
Earnest, Br., launch, ix 174; *Eden*, Br., trials, xvi 342; *Electra*, Br., launch, viii 621; trials, xiii 271; *Epée*, Fr., speed, xiii 499; *Erne*, Br., trials, xvi 259, 347; *Ettrich*, Br., trials, xvi 259, 346; evolution of, xiv 580; *Exe*, Br., trials, xvi 259, 341; experience with, xiii 460;

Destroyers.
Express, Br., note, viii 622, ix 173; launch, x 225; trial data, xiii 774; speed.....xiv 324
Falcon, Br., trials, xii 838, xiii 271; *Fame*, Br., launch, viii 400; coal consumption, ix 173; trials, ix 419; *Fauconneau*, Fr., des., x 261; speed, xii 839; *Fawn*, Br., launch, ix 420; *Ferret*, Br., note, vii 821; des. and trial, vi 613; trials, xi 329; *Filine*, Rus., trials, xiv 683; *Flying-Fish*, Br., launch, ix 420; speed, ix 807; coal consumption, x 571; *Foam*, Br., launch, viii 844; for sea service, x 1134; *Forel*, Rus., speed, xiii 793; *Foyle*, Br., trials, xvi 259, 342; *Framée*, Fr., sinking of, xii 1106; *Furor*, Sp., launch, viii 856; trials..... .....ix 189
Gagara, Rus., trials, xiv 683; *Gipsy*, Br., launch, ix 421; speed, x 573; *Greyhound*, Br., coal consumption, xiv 323; experiments on, xvi 306; *Guardia Marina Riquelme*, Chili, launch, viii 611; trials.....ix 141
Handy, Br., launch, vii 426; machinery, viii 393; *Hardy*, Br., trial, viii 620; *Hart*, Br., trial, viii 180; machinery viii 393; *Haughty*, Br., launch, vii 823; trials, viii 180, 397; *Havock*, Br., des., v 655; speed and power, vii 426; trials, xi 328, xiii 271; *Hopkins*, named, x 818; launch, xiv 616; full data, xiii 1082; des. and contract trials, xv 694; *Hornet*, Br., des., v 655; speed and power, vii 426; trials, xi 329; *Hull*, named, x 818; launch, xiv 947; full data, xiii 1082; des. and contract trials, xv 694; *Hunter*, Br., launch, viii 180; machinery, viii 393
Ikadsuchi, Jap., des., xii 257; data, xi 259; *Inadsuma*, Jap., des., xii 257; influence of bilge keels, xiii 455; *Itchen*, Br., trials.....xvi 259
Janus, Br., launch and des., vii 425; des. and trials, viii 835; trials, xi 328; Japan, xiv 677; built by Thornycroft, xiv 55; built by Yarrow, xiv 55; 1897, ix 183; *Jed*, Br., trials..... .....xvi 1008, 1326
Kale, Br., launch, xvi 1326; *Kangaroo*, Br., speed, xiii 491; *Kennet*, Br., trials, xvi 1008, 1326; *Kephal*, Rus., speed, xiv 994; *Kasumi*, Jap.....xiv 343
La Hire, Fr., dimensions, viii 190; boilers, xii 569; *Lawrence*, named, x 818; launch, xii 1096; full data, xiii 1082; contract trial, xv 667; *Lee*, Br., trials, xiii 271; coal consumption, xiii 281; *Leopard*, Br., launch, ix 421; *Liffey*, Br., launch, xvi 1326; *Lightning*, Br., launch and des., vii 425; accident to, viii 172; des. and trials, viii 835; *Lively*, Br., trials, xiii 491; *Locust*, Br., launch, ix 174; coal consumption, x 237; trials, x 571; *Lossus*, Rus., launch, xiv 682; speed, xiv 995; *Lynx*, Br., preliminary trials, vi 614; trials, vi 804; accident, vii 170; repairs to, vii 821; note, vii 821; grounding.....ix 807
Macdonough, named, x 818; launch and des., xiii 255; full data, xiii 1082; contract trial, xv 667; *Mallard*, Br., launch, ix 174; trials, ix 804; *Mermaid*, Br., launch, x 572; speed, x 1195; *Mode*, Swed., launch, xiv 996; trials, xiv 1266; *Mousqueton*, Fr., trials, xvi 349; *Murakumo*, Jap., data, xi 260; *Myrmidon*, Br., speed.....xiii 491
Natter, Aus., note, viii 385; *Nembo*, It., launch, xiii 788; trials, xiv 341, 1260; new torpedo craft of the British Navy, v 655; *Niji*, Jap., des., xii 256; *Nos. 1* to *16*, U. S., named, x 817; data, x 818; *No. 107*, Ger., speed, xiv 676; *Nyrok*, Rus., trials.....xiv 684

Destroyers.
O'Brien, Chili, purchase, xiv 618; of submarine boats, xiii 731; *Opossum*, Br., trials, viii 396; *Osado*, Sp., dimensions, ix 192; launch, ix 438; *Osprey*, Br., speed, ix 808; *Ostrich*, Br., launch, xii 565; trials, xii 838, xiii 271; *Otter*, Br., launch, ix 174; *Ovoro*, Jap., des.....xii 257
Panther, Br., launch, iv 174; speed, ix 808; *Paul Jones*, named, x 818; full data, xiii 1082; contract and standardization trial, xiv 773; *Perry*, named, x 818; *Perry*, launch, xii 1096; trials, xiii 473; full data, xiii 1082; data, xiv 616; contract and standardization trial, xiv 773; *Petrel*, Br., coal consumption, xii 564; trials, xiii 271; *Pique*, Fr., data, xiii 499; lack of stability, xiv 330; *Pluton*, Sp., note, ix 438; launch, ix 825; trials, x 270; *Porcupine*, Br., des. and trials, viii 835; unsuccessful trial, viii 398; *Preble*, named, x 818; full data, xiii 1082; contract and standardization trial, xiv 773; *Proserpina*, Sp., note, ix 438; launch, x 270; progress in.....xi 915
Quail, Br., launch, vii 820; launch and trials.....ix 172
Racehorse, Br., launch, xiii 282; *Ranger*, Br., trials, viii 397; *Recruit*, Br., launch, viii 841; trials, xiii 271; report on.—Chandler-Linnard, xiv 282; request of contractors for increased price, xiv 295; *Rocket*, Br., launch, vi 805; trials, vii 423; machinery, trials, breakdown, viii 175, 179; breakdown, viii 621; Russian, contract for.....viii 201
Sabre, Fr., trials, xvi 1011; *Salmon*, Br., trials, vii 817; machinery, viii 844; repairs, xiv 564; *Sazanami*, Jap., des., xii 257; *Seal*, Br., launch, ix 421; trials, x 237; *Shark*, Br., preliminary trial, vii 170; trials, vii 423; machinery and trials, viii 175; *Shirakumo*, Jap., launch, xiii 1119; trials, xiv 358; *Skate*, Br., repairs, viii 620; *Snapper*, Br., machinery, viii 844; *Sokol*, Rus., des., vii 606, 833; *Som*, Rus., trials, xii 576; Sp. (two), contract for, viii 202; *Sparrowhawk*, Br., launch, vii 820; trials, viii 842; correction of data, ix 173; loss of, xvi 1327; *Spitfire*, Br., machinery, ix 168; speed, viii 843; full-power trials, ix 690; *Spiteful*, Br., trials, xii 245; oil-fuel trials, xvi 1328; *Sprightly*, Br., speed, xiii 776; *Stag*, Br., trials, xiii 271; *Star*, Br., launch, viii 841; trials, ix 418; preliminary trials, x 230; *Starfish*, Br., trials, vii 818; *Stertiade*, Rus., speed, xiii 793; *Stewart*, named, x 818; full data, xiii 1082; trials, xiv 1237; des. and contract trial, xv 111; strength of, xiv 1186; *Sturgeon*, Br., note, vii 822; *Success*, Br., speed, xiv 658; *Sunfish*, Br., trial, viii 181; speed, vii 822; *Surly*, Br., trials, vii 423; machinery and trials, viii 175; oil fuel, x 863; *Swordfish*, Br., des. and trial, viii 618; trials, viii 843; machinery, ix 168; full-power trial, ix 691; *Sylvia*, Br., speed, x 660; *Syren*, Br., trials.....xiii 1112, xiv 322
Tarpa, Chili, purchase, xiv 618; *Teazer*, Br., machinery, viii 621; *Teniente Serrano*, Chili, launch, viii 611; trials, ix 141; *Terror*, Sp., launch, viii 856; trials, ix, 189; *Teviot*, Br., trials, xvi 259; thirty-knot, Br., dimensions, vii 820; twelve ordered, viii 186; seventeen ordered and named, viii 401; eighteen ordered and named, viii 622; thirty-two-knot Br., two ordered, viii 401; *Thompson*, Chili, pur-

Destroyers.
chase, xiv 618; *Thorn*, Br., trials, xiii 271; Thornycroft.—Barnaby, vii 711; *Thrasher*, Br., launch, viii 181; trials, ix 172; grounding, ix 807, x 232; *Truxtun*, named, x 818; launch, xiii 770; full data, xiii 1082; speed, xiv 948; contract and progressive trial, xiv 1083; *Turbine*, It., launch, xiv 343; trials, xiv 1262; Turkish, one ordered.....vi 810
United States, general data, xiii 1082; *Usk*, Br., trials, xvi 259, 690; *Usugumo*, Jap., launch.....xii 259
Valkyrien, Nor., des., viii 851; *Velox*, Br., trials, xvi 259; *Vigilant*, Br. trials, xiii 271; *Violet*, Br., speed, ix 808, x 230; coal consumption, x 571; *Viper*, Br., data, xi 1104; trials, xii 565, xiii 284, 780; speed, xii 244; *Virago*, Br., launch, viii 181; trials, ix 171; *Vixen*, Br., machinery space.....xiii 867
Welland, Br., launch, xvi 691; des. xvi 1005; *Whipple*, named, x 818; launch, xiii 770; full data, xiii 1082; speed, xiv 948; contract and progressive trial, xiv 1083; *Whiting*, Br., launch, viii 841; speed, ix 420; *Wizard*, Br., machinery, viii 621; *Wolf*, Br., coal consumption, x 240; trials, x 572; *Worden*, named, x 818; launch, xiii 770; full data, xiii 1082; contract and progressive trial.....xiv 1083
Zafiro, It., accident to, xvi 1019; *Zebra*, Br., launch, viii 181; machinery, viii 621; *Zephyr*, Br., trials.....xiii 271
Destruction of the Steamship *Progreso*.—Morgan.....xv 272
Destruction of the machine shops of the New York Navy Yard by fire..xi 185
Desulphurization of iron.....iv 757
Details in marine engineering.—Mudd.....iii 238
Details of British warships launched, 1892.....v 226
Details of construction and arrangement of marine machinery.....xiv 1
Details of construction of the Niclausse boiler.—Hartley.....xiii 377
Deterioration of boilers.....iv 684
Deterioration of boilers, preservation of marine boilers.....iii 179
Deterioration of condenser tubes.....xv 203
Deterioration of condenser tubes (*Baltimore*).....iv 114
Deterioration of steel vessels from effects of corrosion.....xiv 599
Determination of the dryness of steam.—Unwin, vii 297; discussion: Longridge, vii 316; Donkin, 317; Halpin, 318; Beare, 318; Clarkson, 319; Sankey, 320; Barr, 320; Crompton, 320; Cawley, 321; Lockart, 322; Head, 323; Rumley, 324; Clark, 324; reply to discussion: Unwin.....325
Determination of valve-gear circles.....iii 552
Detroit Boat Works, description of yacht building by.....vii 446
Detroit, cruiser *No. 10*, launch, named, iii 595; des. and bids, i 253, 350; launch, iv 117; work on, iv 293; trial, v 500; air-pump data, vi 532; steaming radius, xiii 56–58; coal consumption.....xv 366, 379
Deutchland, mer. str., des., xi 264, xii 264, 1125, xiii 521, xiv 1272; vibration tests, xiii 428; dimensions, machinery data and weights, xiii 862; record run, xii 850; xiii 797; machinery space.....xiii 867
De Valin, Charles E., Chief Engineer, U. S. N.—Obituary.....iv 870
Devastation, Br., des., i 264; ferruled boiler tubes, iv 837; trial.....v 1046

Development in design and construction of German men-of-war.—Dietrich, viii 543; discussion: Reed, 555; White, 555; Thornycroft.....556
Development of the marine engine in the last decades.—Bieg.....i 151
Development, constructive, of the Dürr boiler in the German Navy...xiii 881
Development of the submarine in the direction of increased scope.—Halligan.....xv 1211
Development of the Yarrow boiler for use in battleships.—Crush.....xv 834
Devonshire, Br., combination boilers, Niclausse and cylindrical, xiv 921; trials.....xvi 682
Devonshire class, Br., boiler discussion.....xiv 606
De Witt C. Ivins, see *Nezinscot*.
Dewrance, John.—Machinery bearings, ix 104; the bearings of the marine engine.....ix 118
Diadem, Br., note, vii 814; des., vii 418, viii 828, x 1197; trials, x 240, 425, 430, xi 243, 322; auxiliary machinery, coal consumption data, x 434; machinery and speed, x 568; machinery data, xi 330; compared to *Jeanne d'Arc*, Fr., xi 797; Gibraltar to the Nore, xii 736; Arosa Bay to Sheerness, xii 738; data, comparison with protected cruiser, xii 1015; boilers.....xvi 921
Diagrams.
Acceleration and tangential pressure, German naval vessels, cylinder and crank arrangement, xiv 30 to 36; air pumps, indicator cards, vi 532; *Albany*, indicator cards, xii 313; arrangement of pipes, red-hot furnace crown experiments, iii 226; arrangements (two) of tubes in tube sheets, v 333; Atlantic liners, performances.....iv 100
Balancing of engines, iv 253; *Bancroft*, horsepower, v 380; trial performance, v 384; indicator cards, v 384; Belleville boilers, ii 566; Belleville and Scotch boilers compared, ii 379; bilge keels, vii 560; Blake vertical, twin, air pumps, distribution of forces, x 62; boiler evaporation, x 414; boilers, Scotch, Thornycroft, Belleville, Ward, ii 418; boilers, strength of seams.....viii 270, 275
Centrifugal pump vanes, iii 570; changes in the "grain" and "cement" of steel while cooling and re-heating, xiv 156, 157; *Chicago*, I.P. valve gear, xii 914, 919; *Cincinnati*, boiler test, melting point of metals, xii 887; *City of Paris*, machinery space, vi 304; indicator cards, vi 320; coal consumption, Purdue locomotive, xiii 87; collapsed furnaces, ix 396; *Columbia*, indicator cards, vi 44; combustion-chamber temperatures, v 446; combustion tester of the *Sicilia*, It., viii 585; compression of steam in clearance spaces, x 646, 654, xii 316, 767, xiii 105–7; *Concord's* steam pipe, iii 420; connecting rod, centrifugal action, ii 434, 436; connections, Navy Yard, New York, xiii 996; crank-shaft stresses, viii 681, ix 503; *Cristobal Colon*, Sp., feed-water arrangement, x 588; cup defenders, 1893, v 654; cylinder arrangement for full power and for cruising, v 100; cylindrical heads for boilers.....iii 222
D'Allest boiler, vii 446; damages to *Victoria*, Br., vi 72, 80; *De Long*, combined indicator cards, xiv 844; *Diadem*, Br., indicator cards, x 428; Diesel motor indicator cards compared with best gas engine...xi 75

Diagrams.
Efficiency of twin screws outboard and inboard turning, x 486; electric power transmission, vi 560; entropy and temperature-entropy, x 329; experiments on escape of steam through orifices.....xiii 1069
Fairfax, mer. str., indicator card, vii 176; *Florida*, indicator cards, xv 574; force and moment polygons, *Charleston*, *Yorktown*, *Vesuvius* and *Cushing*, iii 32; Foster automatic safety stop valves, viii 593; Fox's corrugated furnaces, iv 260; *Fuerst Bismarck*, mer. str., indicator card, iii 610; furnaces, factors of safety, v 30; longitudinal elasticity, v 36; Morison, Fox, sections, v 27; strength co-efficients, v 28; tests.....v 26
Gasoline engines, Holland submarines, indicator cards, xiii 148; graphic method of considering obliquity of connecting rods in valve diagrams, v 992; *Gresham*, indicator cards.....ix 266
Hudson, indicator cards.....v 703
Illinois, mer. str., iii 470; *Inchdune* and *Inchmarlo*, mer. strs., indicator cards, xiii 157; *Indiana*, indicator cards, vii 666; *Iroquois*, mer. str., indicator cards, vi 460; indicator cards showing compression, xiii 422; indicator diagram, multiple-expansion engines.....x 47
Kearsarge, indicator cards.....xi 848
Lawrence, indicator cards, xv 684; valves.....xv 685
Macdonough, indicator cards, xv 692; valves, xv 692; *Maine* (old), indicator cards, vii 32; *Majestic*, mer. str., indicator cards, iii 288; *Manning*, indicator cards, ix 724; *McCulloch*, ix 725; Marshall valve gear, *Philadelphia*, ii 536; *Massachusetts*, indicator cards, viii 269; *Minneapolis*, final course, vi 712; fireroom arrangement, vi 722; indicator cards, vi 730; steam consumption tests .....x 52
Nevada, indicator cards, xv 109; *Newark*, L.P. valve diagram, xii 333, 682; *New York*, indicator cards, v 636; new battleship, battery arrangements.....xiii 750
Oregon, ice-machine indicator cards, viii 466; *Olympia*, indicator cards.....vi 256
Patrol, police boat, N. Y., indicator cards, vi 348; *Paul Jones*, *Perry*, *Preble*, indicator cards, xiv 810; *Pennsylvania*, mer. str., indicator cards, xi 586; production of ore in lake region.....xv 468
Radical valve gears, iii 554; receiver superheater, efficiency of, xii 752; relative positions of *Victoria* and *Camperdown*, vi 76; *Resolution*, Br., inclined under various conditions.....vi 492
Screw propeller element, iv 75, 77; slide valve, vi 273; *Sovereign*, yacht, x 612; standard, dimensions, copper, pipes, flanges and boiler rivets, iii 421; steam admission, steam turbines, Westinghouse-Parsons, xiii 130; steam cutter for German navy, indicator cards, xiii 426; steam-pipe explosions, German navy, vii 740; steel plate, tensile strength at varying temperatures, v 34; stresses of elastic gears, friction.....xii 654
Temperature, entropy, viii 287; for steam and water, viii 285; tests, riveted joints, iv 624; *Texas*, indicator cards, viii, 92; theory of the centrifugal pump, iii 488; theory of multiple-effect, evaporators,

Diagrams.
xii 98; *Thornton*, indicator cards, xiii 606; torsional vibrations of shafting, xiv 446, 742; *Truxtun*, *Whipple*, *Worden*, indicator cards, xiv 1106; tube plates, heat transmission.....v 33
Valve-gear solutions.....xiv 1142, 1146
Water consumption, Purdue locomotive, xiii 89; *Wisconsin*, indicator cards, xii 994; *Wyoming*, indicator cards.....xv 98
Yarrow automatic-feed regulator, viii 792; Yarrow boiler, viii 409; relations of heating surface to weight, xv 841; *Yorktown's* economic qualities.....iv 671
Diameter of cylinders for successive expansion engines, formula for.....i 147
Diameter of propeller shafts.....xii 451
Diamond, Br., launch, xvi 343; compared with *Amethyst*, turbines...xvi 1242
Diana, Br., launch, viii 170; trials, viii 833, xi 324; boilers.....xii 714
Diana, Rus., note, viii 638; des., ix 188, 823; trial.....xiv 683
D'Iberville, Fr., launch, v 1063; des. and trials.....vi 806
Dickie, G. W.—Discussion, of speed trials of fast ships, ii 87; discussion, air pumps.....vi 547
Dickinson screw propellers, v 300; on steamers *Belle of Dunkerque* and *Herongate*.....v 314
Dictionary of electrical words, terms and phrases.—Houston, book received.....vi 646
Dido, Br., launch and des., viii 388; trials.....ix 162, xi 324
Diesel motor, the.—Meier, x 162; discussion: Jones, x 182; Kafer, x 182; Whitham, x 182; compared with gas and oil engines, xi 75; test, xi 73; and steam engines, thermal efficiency.....xi 396
Die Technische Entwicklung des Norddeutschen-Lloyds, book received, vi 226
Dietrich, H., Constructor-in-Chief, Imperial German Navy.—Development in design and construction of German men-of-war.....viii 543
Difficulties in floating the *Paris*.....xii 231
Digest of the experiments made by Mr. Michel Longridge on the triple-expansion pumping engines, East London Water Work, Lea Bridge, etc., etc.—Isherwood.....vii 215
Digest of Professor Cecil H. Peabody's experiment with the George F. Blake Mfg. Co.'s pumping engine supplying potable water to the city of Newton, Mass.—Isherwood.....v 769
Dimensions and displacement of ships, rules for determining.....xiv 546
Dinger, Henry C., Lt., U. S. N.—Actual performance of Babcock & Wilcox boilers, as installed in U. S. S. *Marietta*, with general observations on practical requirements and the successful operation of marine water-tube boilers, xv 59; improvement in installation of naval machinery, xvi 98; notes on routine work of engineer division of naval vessels.....xvi 1164
Diogenes, see *Topeka*.
Direct current for electric-power transmission.....xiv 817, 1109
Direct-current electric transmission.....xii 411
Direct-current machines, capacity limits in.....xi 1064

Direction of rotation of propellers.—Pecoraro.....xv 1080
Direction of rotation of propellers on twin-screw war vessels.....xv 1175
Direction of turning of twin-screws, effect of.....x 485
Direct utilization of producer gas in Europe.....xi 111
Displacement and dimensions of ships, rules for determining.....xiv 546
Distillers, heat loss.....xvi 105
Distilling plant, "Lillie" multiple-effect, Dry Tortugas, tests.....xii 85
Distilling ship *Iris*, test of evaporating plant.....xi 889
Distortion and resistance of flat heads.....x 660
Distribution and transmission of power on modern ships.—Soliani.....iv 173
Diving bell, Ryerson's.....xiv 850
Dixie, data, x 534; steaming radius, xiii 58; coal consumption....xv 366, 379
Dixon, A. F., Commander, U. S. N.—Walking-beam counter-balance for turning-crank pins.....xiv 527
Dobson, Benjamin A.—Electric welding.....vi 774
Dock, graving, Stettin.....x 677
Dock, pontoon, Bermuda.....xiv 278
Docks, floating, xiii 193; Algiers, La., test, xiv 279; South Brooklyn, xii 457; two, large.....ix 780
Docks, Japan.....xi 773
Docking of battleships, Japanese methods compared with others.....xiv 922
Dolphin, authorization and data, i 236; engine and boiler data, iii 422; propeller data, iv 158, 402; air-pump data, vi 532; efficiency of coke, vi 736; practical test George's Creek Cumberland coal, vii 329; power required for air and circulating pumps, vii 135; steam consumption tests, x 74; steaming radius.....xiii 58
Dominion, Br., trial under new rules, xvi 1286; trial and des., xvi 1315; data.....xiii 770, xiv 1251
Don Juan de Castro, Port., note.....ix 822
Don Alvaro de Bazan, Sp., launch and des.....ix 825
Don Carlos I, Port., launch and dimensions, x 894; trials.....xi 530
Donaldson's tube-bending machine.....xii 34
Doña Maria de Molina, Sp., launch.....viii 855
Donegal, Br., launch and des., xiv 1245; trials.....xvi 258
Donegal, mer. str., comparison with steam-turbine vessels, xvi 629; propellers, xvi 631; trials.....xvi 1340
Don Juan de Austria, ice machine.....xiv 525
Donkin, Bryan.—Discussion, determination of dryness in steam.....vii 317
Donnacona, mer. str., data.....xiii 538
Doone, Br., launch.....xvi 1326
Doors, watertight, between bunkers, xiii 9; dangers of in modern fighting ships, viii 319; various designs and methods of working.....viii 319
Doris, Br., referred to with *Juno*, viii 169; characteristics, viii 557; launch, viii 390; launch and trials, ix 162; trials, xi 324; coal consumption...ix 414
Doris, mer. str., dimensions, machinery weights, data.....xiii 862
Dorothea, auxiliary navy, x 536; data.....x 824
Double current for electric power transmission.....xiv 817, 1109
Dove, Br., trials.....xiii 271, xiv 208

Downcomers, water-tube boilers, heated and non-heated.....viii 497
Down-draft forges.....xii 524
Dow pumps, list of, *Oregon*.....viii 461
Dowst, F. B.—Fan blowers.....iii 473
Draft and trim of battleships.....vi 465
Draft: artificial, and its effect on boiler construction, iii 349; forced, compressed air system for, i 330; forced, new system, xi 754; induced, Martin's system, ii 567; induced, combined with hot air, in boilers fitted with "Serve" tubes and retarders, v 828; mechanical, closed stoke hole, Howden, Ellis & Eaves, and closed ash pit, systems compared, viii 140; mechanical, comparison of systems, viii 140; mechanical, economy of, xii 486; methods of measuring in boiler testing, x 135; suction, for boilers.—Gross.....vi 744
Dragon, Br., des. and trials.....vii 424
Dragon, Fr., launch.....iv 520
Drainage: bilge, iv 92; machinery spaces, arrangement, xiv 13; pipes above inner bottom.....iv 92
Drake, Br., launch and des., xiii 486; machinery trials, xiv 310; trials, xiv 950, 1241; experiments with propellers, xiv 1248; screw propellers of.....xvi 308
Drake class, Br., data.....xi 518
Dreadnought, Br., speed and power, vi 493; coal consumption, xiii 1029, 1031, 1032
Dreamer, yacht, data.....xii 270
Dredge, electrical.....xi 1016
Drills, end pressure on.....xii 222
Drill stations, engineer division.....xvi 1185
Dristigheten, Swed., data, xi 1115; trials.....xiv 690
Drive, gas engine, in a machine shop.....xi 450
Drives, rope.....xi 133
Drooling burner, oil.....xvi 844
Drums, Niclausse boiler.....xiii 389
Dryad, Br., des., iv 833; launch and des.....vi 614
Drydocks: balanced, sectional, xiii 443; Baltimore, xiii 448; Boston navy yard, xi 727; floating, Algiers, xi 988; floating, Cavite, strategic value, xv 472; floating, military possibilities and value, xv 1; Ger., xi 1037; Gibraltar, xiii 448, 1081; Glasgow, x 521; Havana, xiii 709; Hunters Point, Cal. (750 feet), xii 1033; Kaiser, Bremerhaven, xii 222; largest on the Great Lakes, iv 783; League Island, Mare Island, Boston and Portsmouth, xi 984; Newport News, x 522, 1106, xiii 448; Oriental, Shanghai, xi 1077; reconstruction of, xii 166; Shanghai, xii 525; South Brooklyn, xiii 710; Stettin, x 677; Vladivostock.....xiii 452
Dryness of steam, determination of.....vii 297
Dry sand, molding cylinder in, Bath Iron Works.....iv 159
Dry Tortugas distilling plant "Lillie," multiple-effect, tests.....xii 85
Dubuque, launch.....xvi 995
Du Chayla, Fr., launch, viii 188; dimensions, vi 204, x 261; preliminary trial.....ix 812

Duke of Clarence, mer. str., des.....iv 326
Duke of Cornwall, mer. str., des., x 925; dimensions, machinery weights, data, xiii 862; machinery space.....xiii 867
Duke of Edinburgh, Br., launch and des.....xvi 100
Duke of Edinburgh class, Br., weight of machinery.....xvi 262
Duke of York, mer. str., des.....vi 636, 836
Duncan, Br., machinery space, xiii 867; trials.....xvi 260
Duncan class, Br., des.....xi 517, xiv 953
Duncan, John.—Discussion: effect of direction of turning of twin screws.....x 490
Dunell, George R.—Discussion: experiments on the arrangement of the surface of a screw propeller.....v 321
Dungeness, yacht, des.....vi 221
Dunn, James.—Arrangement and equipment of ship-building works...xiii 947
Dunois, Fr., dimensions, viii 190; data.....ix 813
Dunolly Castle, mer. str., dimensions.....ix 205
Dunottar Castle, mer. str., des.....iii 290
Dunvegan Castle, mer. str., dimensions, viii 655; machinery.....viii 866
Dupetit Thouars, Fr., launch, xiii 781; des., x 870, ix 909, xvi 1330; data.....xi 252
Dupleix, Fr., des., x 574; engines, x 886; note.....xiv 666
Duplication of fittings, effect on size and cost of warships.....xv 350
Dupont, torpedo boat *No. 7*, launch, ix 401; full data, x 818, xiii 1082; repairs, x 221; steaming radius.....xiii 58
Dupuy de Lôme, Fr., characteristics, iii 142; triple screws, iv 289; trial and des., iv 516; compared with British cruisers, iv 839; boiler accident, v 1061; trials, vii 429; defective boilers, xiv 325; new boilers.....xvi 350
Durability of different metal coatings immersed in sea water.....x 781
Durand, Prof. Wm. F.—Treatment of non-algebraic curves for maxima and minima by the use of ordinates, iv 71; a study of the element of a screw propeller, iv 73; the influence of shock on propeller efficiency, iv 611; analysis of certain curves arising in engineering investigations, v 543; discussion, experimental station and engineer school, vii 459; curves showing the relation between equivalent hollow and solid shafts, vii 507; a method of determining a continuous record of the performance of a marine engine, ix 1; electrical propulsion for topedo boats, x 53; discussion, steam consumption of the *Minneapolis*, x 67; entropy and temperature-entropy diagrams, x 329; translation, progressive trials of the Italian torpedo-boat *Condor*, xii 77; graphical chart for the solution of valve-gear problems, xiv 1141; a problem connected with the screw propeller.....xv 887
Durandal, Fr., note.....viii 850
Durandal and *Hallebarde* vs. *Pique* and *Epée*, outboard- vs. inboard-turning propellers.....xv 1183
Dürr boilers: vi 361; advantages and disadvantages, xiii 923; *Baden*, Ger., xiii 887, 901, xiv 117; baffling, xiii 909; *Bayern*, Ger., xiii 888, 901, xiv 117; boiler committee report, xiv 875; British cruisers, xiv 234; British report, xvi 920; compared with others, xiv 418; cruiser

B, Ger., xiii 897; experimental, Kiel, xiii 885, 901; German Navy, xiii 881; in navies, xvi 292; interim report of boiler committee, xiii 358; *Medusa*, Br., xiv 643, xvi 336; *Prinz Heinrich*, Ger., xiii 895, 901; *Rhein*, Ger., xiii 881; *Roxburgh*, Br., *Encounter*, Br., xiv 921; *Sachsen*, Ger., xiii 901, xiv 117; ships fitted with, data, xiv 498; *Victoria Louise*, Ger., xiii 891, xiv 117; *Vineta*, Ger.....xiii 895, 901, xiv 117, 216

Durston, Sir John (Albert J.), Engineer-in-Chief, R. N.—The transmission of heat through tube plates, v 436; reply to discussion, v 463; machinery of British warships, vii 332; extract from address of the President of the Institute of Marine Engineers, vii 779; discussion on water-tube boilers, viii 501; discussion, Yarrow's feed-water heater, x 417; recent trials of the cruiser *Diadem* (1898), x 425; reply to discussion, x 438; trials and experiments made in H. M. S. *Argonaut*, xi 361

Dutch Navy, Yarrow boilers in.....xv 838

Du Temple boilers, v 946; notes on.....viii 786

Du Temple-Guyot boilers: *Jules Michelet*, Fr., xvi 352; *Jurien de la Gravière*, Fr., xiv 669; tests.....ix 772

Duties and responsibilities of the naval engineer in the British Navy...xii 498

Duty and capacity tests of high-service pumping engines, Washington, D. C.—Baird. .....i 41

Duty trial of a Blake high-duty pumping engine at the city waterworks, Newton, Mass.—Dean.....v 465

Dwarf, Br., contract, ix 804; des., x 1187; trials.....xii 246

Dwelshauvers-Dery, Prof. M.—Experiments on the compression of steam in the clearance space.....x 641

Dwight, John, see *Pawnee*.

Dynamical action of shafting of marine engines.....xiv 721

Dynamo engines, steam-consumption tests, *Minneapolis*.....x 28

Dynamos, auxiliary engines, etc.....iii 586

Dynamos: compound, series field windings, xii 178; continuous-current, design of, ii 308; power plant, Navy Yard, N. Y., xiii 987; testing of, v 181

Dyson, C. W., Lt. Comdr., U. S. N.—Organization of the engineer division on board a man-of-war, xiii 925; water-tube boiler installations in the world's navies, xiv 493; screw propellers of U. S. naval vessels.....xv 281

E

E, Aus., armored cruiser, data, xiii 1088; compared to *Kleber*, Fr....xiv 1255

Eagle, data.....x 534

Eames, Hayden.—Education and training of naval officers.....xv 902

Early steamboats.—Baird.....xi 158

Earnest, Br., launch.....ix 174

East Boston, data.....x 824

East London Water Works, triple-expansion pumping engines.....vii 215

East Point, mer. str., data.....xiii 538

East River bridge, cables.....xii 226

Eaton, W. C., Lt. Comdr., U. S. N.—Corrugated furnaces, tests of Brown's improved type.....xv 182

Eckhart, W. R.—Discussion of speed trials of fast ships.....ii 86
Eclair, Fr., torpedo boat, des.....iv 127
Eclatante, Fr., des.....vii 173
Eclipse, Br., launch and des., vi 604; trials, viii 615, xi 324; battery compared to *Olympia*.....x 786
Economic marine propulsion.—Lowe.....iii 218
Economic vaporization of George's Creek Cumberland coal.....vii 329
Economical speed and coal endurance of war vessels, as affected by the relation of the coal expended for propulsion to that expended for all other purposes.—Hollis, v 66. Discussion: Isherwood, v 83; Emory, 93; Mattice, 95; Forsyth, 104; Kinkaid, 105; Baird, 108; Gow, 112; Wheeler, 474; Hollis.....114
Economical speed of cruisers.....iv 644, 654
Economical speed of ships, limits of.....xiii 661
Economical voyages of S. S. *Heighington*.....iv 864
Economizers in the Russian Navy.....xiii 202
Economy of: air pumps, vi 527; coal by use of retarders in Scotch boilers, viii 778; electric lamps.—Baird, x 404; electric transmission in factories and mills, xii 419; large cotton-mill engine, test, x 665; mechanical draft, xii 486; steam turbines in cruisers, xvi 1242; superheating, x 205; working at low power.....vi 592
Eden, Br., trials.....xvi 342
Edgar, Br., des., iii 134; trial and des., iv 122; performance data, v 504; machinery data.....viii 568
Edgar class, Br., characteristics, iii 142; trials.....xi 322
Edgard Quinet, Fr., des.....xvi 1329
Edinburgh, Br., coal consumption.....xiii 1029, 1031, 1032
Edison storage battery.....xiii 1075
Edison storage battery.—Kennelly.....xiii 669
Edison's work in storage batteries.....xiii 456
Edson, Jarvis B.—Discussion, trials of the Niclausse, safety water-tube boiler.....x 124
Education and training of naval officers.—Eames.....xv 902
Education of naval engineers for future needs.—Manning.....xv 850
Education, technical.....xii 508
Edward Luckenback, see *Tecumseh*.
Edwards, John R., Comdr., U. S. N.—Discussion, experimental station and engineer school, vii 481; liquid fuel for naval purposes, vii 744; relation of the duties of the naval engineer officer to the "problem," viii 21; coaling of warships, xiii 1; liquid fuel report.....xvi 719
Effect of: auxiliaries on economical speed, v 66; circulation in water-tube boilers on evaporation, xii 194; depth of water on speeds of ships.—White, iv 281; draught of water on speed, v 821; form of ship on speed, v 819; impurities on copper, xvi 981; long pipe connections on indicator diagrams, ix 392; shell fire on tanks of petroleum, v 486; shoal water on speeds of ships, iv 329; size of ship on speed.....v 818
Efficiency, evaporative: Babcock & Wilcox boiler, test to determine, vii 694; French briquettes.....vii 578

Efficiency, electrical.....vi 557, 581
Efficiency of: coke, *Dolphin*, vi 736; machinery, nominal, xi 763; joints, riveted, Watertown Arsenal tests for Bureau Steam Engineering, iv 634; propellers, influence of shock on, iv 611; receiver superheater, xii 749; screw propellers, apparatus for ascertaining the, v 970; steam engines, thermal, xi 949; steam engine, terms of, x 517; steam-jacketed single-cylinder engines, v 277; steam-jacketed triple-expansion engine, v 288; steam separators, iii 591; water-tube boilers, xi 994; water-tube boilers, formulae for.....vii 124
Eickenradt, F.—Use of electricity on board ships.....viii 569
Eider, mer. str., data.....vi 162
Ekaterina, Rus., repairs.....xiv 682
Ekaterinoslav, mer. str., launch.....viii 427
El Alba, mer. str., data, xiii 1142; speed.....xiv 369
Elastic gears, inertia stresses.....xii 329, 603, 913
Elasticity of back-tube sheets.....iii 451
Elba, It., trials.....vii 831
Elbe, mer. str., bursting of copper steam pipes, iii 410; data.....vi 162
El Cid, mer. str., des.....xii 262
El Dia, mer. str., des.....xiii 797
Eleanor, yacht.....vi 220
Electra, Br., data, vii 820; launch, viii 621; trials.....xiii 271
Electra, yacht, des.....x 301
Electric: and steam drive for auxiliaries, compared, xvi 110; communications, v 178; cranes, traveling, v 921; drive for tools in shipbuilding works, xiii 951; driving in shops, xii 162; distribution, one- and two-wire systems, xii 489; lamp, Nernst, xi 215; lamps, economy of, x 404; launches, vi 698; light, cost of, *Albatross*, vi 516; lighting.—Kennedy, vi 550; lighting of ships, iii 510; discussion: Baird, iii 517; Little, 521; Davis, 522; Noll, 523; lighting plant for ships, iv 802; lighting plant, Government Hospital for the Insane, Washington, D. C., construction, installation and performance, ix 237; lighting *Tchihatchoff*, mer. str., v 183; machinery, behavior with, x 1156; motors, for small vessels, v 887; efficiencies, vi 557; weight and power, vi 582; plants, gas engines for, xi 504; process of annealing armor plate, xii 459; pumping plant for the salt-water aquaria World's Columbian Exposition, 1893.—Bayley, iv 203; sparks, danger from, xi 1079; telegraph, Willis' engine-room signals, iii 200; traction, vi 556; transmission of power for navy yards.—Aldrich, xiv 448, 814, 1109; transmission in factories and mills, xii 402; transmission of power and electric lighting from the point of view of the mechanical engineer.—Kennedy, vi 550; transmission of power in engineering shops, x 1128; traveling cranes, v 921; welding, vi 774; of rails.....xi 1079
Electrical: apparatus, nomenclature of, xii 1043; dredge, xi 1016; efficiencies, ii 321, vi 557, 581; equipment of ships of war, xii 797; operation of tools, xiv 581; plants for shipyards.—McFarland, xvi 309; propulsion for torpedo boats.—Child, x 958; propulsion for torpedo boats.—Durand, xi 53; smoke deposition, xiii 217; tables and memoranda.—

Thompson and Thomas, book received, v 528; vehicles in storms, xi 229; words, terms and phrases, dictionary of.—Houston, book received.....vi 746
Electrically-operated 150-ton jib crane at Newport News shipyard.—Post.....xi 173
Electricity: and magnetism.—Houston, book received, v 252; applications in the Royal Dockyards and Navy, Br.—Deadman, v 178; as motive power for auxiliary engines, iv 173, vi 694, at the New York Navy Yard.—Kollock, xiii 980; for auxiliaries on German men-of-war, viii 550; for ship central-power plant, x 95; for transmitting power on shipboard, iv 190; in the Italian Navy, xi 457; on board ship, xii 230; on board ships.—Greene, xi 411; one hundred years ago and today.—Houston, book received, vi 646; use of on board ships...viii 569
Electrolytic copper tubes, xii 501; process.....viii 792
Element of the screw propeller, study of.....iv 73
Elfrida, data.....x 824
Elgar, Dr. Francis.—Comments on loss of *Victoria*, Br., vi 112; fast ocean steamships, v 808; discussion, conversions and re-armament of ships, xiii 628; discussion, torpedo-boat destroyers.....xiv 406
Elimination of sulphur from iron.—Saniter.....iv 757
Elizabeth Holland, see *Holland* (*Elizabeth*), *Coaler* and *Leonidas*.
Elizabeth Rickmers, mer. st., launch, viii 425; data.....viii 654
Elk, Br., des.....i 266
Ellen Rickmers, mer. str., launch, viii 425, data.....viii 654
Ellida, yacht, dimensions.....vi 645
Ellide, yacht, des.....ix 447, xi 272
Ellis and Eaves suction draft for boilers, vi 744, viii 142; induced draft, *Inchdune* and *Inchmarlo*.....xiii 154
Ellis, J. D.—Some experiments on the combination of induced draft and hot air, applied to marine boilers fitted with "Serve" tubes and retarders.....v 828
El Norte, mer. str., see *Yankee*, launch and des., iv 536; indicator cards..iv 858
El Primero, yacht, data and trials.....v 1090
El Rio, mer. str., see *Prarie;* launch and des.....iv 858
El Siglo, mer. str., launch.....xiii 798
El Sol, see *Yosemite*.
El Sud, mer. str., see *Dixie;* launch.....iv 536
Elton, mer. str., trials.....vi 590
El Toro, see *Algonquin*.
Ely, Geo. H.—The Great Lakes of North America.....v 140
Emergency power in warships, comment on.....i 216
Emery, Dr. Charles Edward.—Discussion of speed trials of fast ships, ii 77; discussion on tubulous boilers, ii 382; discussion, effect of auxiliaries on economical speed and coal endurance, v 93; obituary.....x 943
Emmanuele Filiberto, It., launch, ix 817; des., viii 196; des. and trials, xiii 502; data.....xiii 1116
Emperador Carlos V, Sp., des.....i 360, iii 606
Emperor Alexander III, Rus., launch, xiii 1128; des.....xvi 1336

Emperor Nicholas I, Rus., des., cost and weights.....ii 424
Empire City, mer. str., note.....ix 198
Empress of China, mer. str., machinery data.....viii 568
Empress of India, Br., trials, vi 182; machinery data, viii 568; fitting of hydraulic piping to prevent freezing.....viii 163
Empress of India, mer. str., data, vi 162; machinery data.....viii 568
Ems, mer. str., data.....vi 162
Encounter, Br., boiler and engines, xiii 280; launch and data.....xiv 954
End pressure on drills.....xii 222
Endion, yacht, des..x 930
Endurance, coal, of our new cruisers.....iv 796
Endurance of the ordinary copper alloys in sea water.—Diegel.....xi 336
Endurance of warships, practical and theoretical.....iii 132
Endymion, Br., des., iii 134; trial.....v 745
Energy of bow wave, study of.....xi 591
Engard, Albert C., P. A. Engr., U. S. N.—Notes on modern boiler-shop practice, ii 129; fitting up the crank shafts of the U. S. S. *Newark*....iii 9
Engine bearings, marine.....ix 118
Engine: Blake pumping, Newton, Mass., digest of experiments, v 769; cotton-mill, economy test of, x 665; Ericsson, compound, and Belleville boiler, ii 345; failures, x 1107; framing, xiv 2; weight per I.H.P. on some British vessels, viii 565; gas, drive in a machine shop, xi 450; gas, for a screw scow, vi 415; parts, cargo steamers vs. torpedo boats, stresses, xiii 853; receivers, discussion of, iv 66; -room signals, iii 197, iv 743; discussion, iii 440; the marine.—Hollis, iv 712; trials, marine, iii 374; trials, notes on analysis of, ii 510, iii 33; triple-expansion, advantages and disadvantages for war vessels, iv 718; vibrations, v 977; works, marine, power required.....xiii 1058
Engine data.
Alabama, xii 867; *Albany*, xii 297; *Albatross*, vi 500; *Annapolis*, ix 562; *Arkansas*, xiv 1179; *Australia*, Br., viii 568; *Avon*, Br.....viii 568
Bagley, xiii 1082; *Bainbridge*, xiii 1082, xiv 1009; *Bailey*, xiii 1082; *Baltimore*, i 339, iii 422; *Bancroft*, v 367; *Barney*, xiii 1082; *Barry*, xiii 1082, xiv 1009; *Bennington*, see *Concord; Bergen*, ii 259; *Biddle*, xiii 1082; *Bittern*, Br., viii 568; *Blakely*, xiii 1082, xvi 1081; *Boston*, iii 422, *Brooklyn*.....viii 747
Campania, mer. str., v 392; *Castine*, v 850; *Charleston* (old), i 313, iii 422; *Chauncey*, xiii 1082, xiv 1009; *Chicago*, iii 422; *Cleveland*, xv 1119; *Colorado*, xvi 1125; *Concord*, iii 91, 422; *Condor*, It., xii 78; *Columbia*, vi 16; *Craven, T. A. M.*, xiii 1082; *Cushing*, ii 216, iv 11, xiii 1082
Dahlgren, xiii 1082; *Dale*, xiii 1082; *Davis*, xiii 1082; *Decatur*, xiii 1082, xiv 60; *De Long*, xiii 1082, xiv 830; *Denver*, xvi 74, 612; *Des Moines*, xvi 229; *Dolphin*, iii 422, vi 738; *Dupont*.....xiii 1082
Edgar, Br., viii 568; *Empress of China*, mer. str., viii 568; *Empress of India*, mer. str., viii 568; *Empress of Japan*, mer. str., viii 568; *Ericsson*.....ii 448, xiii 1082
Farragut, xiii 1082; *Flora*, Br., viii 568; *Florida*, xv 559; *Foote*, ix 658, xiii 1082; *Fox*.....xiii 1082

Engine data.
Gibraltar, Br., v 736; *Goldsborough*, xiii 1082; *Gresham*, ix 257; *Gwin*.....x 498, xiii 1082
Helena, ix 363; *Hopkins*, xiii 1082, xv 698; *Hull*, xiii 1082, xv 698; *Hudson*.....v 703
Indiana, vii 645; *Illinois*, xiii 568; *Iona*, mer. str., iii 375; *Iroquois*, mer. str., vi 453; *Iowa*.....ix 461
Jason, Br., viii 568; *John W. Gates*, mer. str., xii 898; *Juno*, Br.....viii 568
Katahdin, viii 6; *Kearsarge*, xi 832; *Kentucky*, xii 7; *Korea*, mer. str.....xiv 383
Latona, Br., viii 568; *Lawrence*, xiii 1082, xv 672; *Lorena*, yacht...xvi 1101
Machias, v 850; *Macdonough*, xiii 1082, xv 672; *Mackenzie*, xiii 1082; *Maine* (old), vii 8; *Maine*, xiv 1128, xvi 528; *Majestic*, Br., viii 568; *Manning*, ix 715; *Marblehead*, vi 131; *Marietta*, ix 644; *Massachusetts*, viii 245; *McCulloch*, ix 715; *McKee*, xiii 1082; *Meteor*, mer. str., i 228; *Minneapolis*, vi 719; *Missouri*, xv 1192; *Mongolia*, mer. str., xvi 239; *Morris*, xiii 1082; *Monterey*.....v 121
Nashville, ix 579; *Newark*, iii 103, 422; *Newport*, ix 552; *New York*, v 618; *Nicholson*, xiii 1082; *Niobe*, Br.....viii 568
O'Brien, xiii 1082; *Ohio*, xvi 1040; *Olympia*, vi 246; *Oregon*, iv 820, viii 449
Parthenia, yacht, x 396; *Paul Jones*, xiii 1082, xiv 778; *Pelorus*, Br., viii 568; *Pennsylvania*, mer. str., xi 559; *Perry*, xiii 1082, xiv 778; *Petrel*, iii 422; *Philadelphia*, ii 526, iii 422; *Pioneer*, mer. str., v 245; *Porter*, xiii 1082; *Powerful*, Br., viii 568; *Preble*.....xiii 1082, xiv 778
Rodgers, xiii 1082; *Rowan*.....xiii 1082
San Francisco, ii 540, iii 422; *Shubrick*, xiii 589, 1082; *Somers*, xiii 1082; steam cutters, U. S. Navy, xiv 42; *Stewart*, xiii 1082, xv 113; *Stockton*, xiii 1082; *Stringham*, xiii 1082; *Sturgeon* class, Br.....viii 568
Tacoma, xvi 8; *Talbot*, x 498, xiii 1082; *Tarantula*, yacht, xvi 1110; *Terror*, ix 15; *Texas*, viii 88; *Thornton*, xiii 589, 1082; *Tingey*, xiii 1082, xvi 54; *Truxtun*, xiii 1082,xiv 1087; *Turbinia*, yacht, xvi 1105; Turkish torpedo boats, ii 115; typical ocean steamers (forty).....vi 162
Variag, Rus., xii 1011; *Vesuvius*, iii 422; *Vicksburg*, ix 552; *Victory*, mer. str., vii 765; *Ville de Douvres*, mer str.....iv 410, 543
Wacouta, yacht, xiv 1158; *Wheeling*, ix 644; *Whipple*, xiii 1082, xiv 1087; *Wild Duck*, yacht, vii 80; *Wilkes*, xiii 1082, xiv 859; *Wilmington*, ix 363; *Winifred*, mer. str., x 985; *Winslow*, xiii 1082; *Wisconsin*, xii 989; *Worden*, xiii 1082, xiv 1087; Worthington pumping engines, ii 32; *Wyoming*.....xv 88
Yorktown, i 139, iii 422; *Yosemite*, yacht.....vii 670
Zenith City, mer. str.....vii 765
Engineer Division: in the naval militia, necessity of.—Fry, viii 303; organization of, on a man-of-war, xiii 925; routine work, naval vessels, xvi 1164; station bill for.....xvi 1220
Engineer force, suggestions on personnel.....iv 747
Engineer officers: and the "Problem."—Edwards, viii 21; examinations of, for promotions, Navy Regulation Circulars Nos. 52 and 53, i 93, 95; Navy Regulation Circular Nos. 109–110, rescinding Nos. 52–53, iv 462, 468; naval, Admiralty scheme of training.....xv 144

Engineer, routine Atlantic liners..... xvi 886
Engineer school and experimental station, need of.....vii 449
Engineers: in British Navy, duties and responsibilities of, xii 498; naval, education of, xv 850; Japanese in war, xvi 1299; in merchant service, examinations for in proposed rules of steamboat inspection service, iv 239; proposed complements of, under steamboat inspection service rules, iv 233; qualifications of, in proposed rules for steamboat inspection service.....iv 236
"Engineering," April 21, 1893.—Book received.....v 527
Engineering buildings: University of Michigan, xv 908; for the University of Pennsylvania.—Spangler.....xv 578
Engineering Congress, international, v 532; list of authors, v 535; program, papers read, etc.....v 637
Engineering: in the British Navy, xiii 1016.—Durston, vii 779; in the navy.—Hollis, xv 808; laboratory, naval, scope and purpose, xv 512; University of Michigan "Technic," 1888, i 89; marine, in 1897, x 207; review during past ten years, xii 827; marine, some details in, iii 239; mechanical, object lessons, lens and pencil, xi 692; naval, military importance of experiments, xv 512; plant, Cavite naval station, xi 893; research and training, necessity of, vii 449; work, proportion before and after launching in various types of ships.....xiii 964
Engine-room artificers, training of.....xvi 646
Engine-room signals, iv 743; Norton, iii 197; discussion: Lowe, iii 440; McKean, 443; Burd 446
Engines: alteration to high-pressure compound by Ashlin's system, viii 157; and boilers of the *Inchdune* and *Inchmarlo*, xiii 151; auxiliary, steam consumption in warships, Br., xi 388; balancing, the Yarrow-Schlick-Tweedy system of, x 481; calculation of horsepower for marine, viii 310; compound, cylinder, ratios for, xi 118; four-cylinder, triple-expansion, marine, balance of, xiv 121; gas, xii 1083; and oil, early types, x 165; British tests, xi 1038; for electric plants, xi 504; for shop driving, xi 991; *Protector*, xv 1224; using producer gas, xi 113; gasoline, xi 768, Holland submarines, *Nos. 3* to *8*, xiii 144; high-speed, xiv 574; strains, vii 286; interchangeability of parts, xii 106; jacketed, efficiency of, v 288; marine, balancing, iv 246; converted, iv 780; development of, in the last decade, i 151; essentials of good design, xiv 18; factors of safety, vii 794; losses of feed water, vii 486; lubrication of, iii 571; modern, lectures.—McFarland, vi 647; record of continuous performance of, method of determining, ix 1; rotary vs. reciprocating, ix 569; shafting, dynamical action, xiv 721; use of various vapors in, xiv 577; multiple, cylinder, reheaters in, xii 385; multiple expansion, indicator diagrams, xi 46; of German Navy, recent investigations, xiv 18; of thirteen hundred ships, x 1121; proportions for triple-screw, xi 653; pumping, Blake high duty, Newton, Mass., v 465; duty and capacity tests, Washington, D. C., i 41; new high-duty record, x 1090; tests of at New Bedford, Mass., i 299; quadruple-expansion, data and performances, i 77; quadruple-expansion, *Gedeh*, mer. str., iv 864; regulation on, xvi 1197; *Revolution*, design, installation and operation, xv

1241; single-cylinder and triple-expansion, compared, v 271; single-cylinder, jacketed, efficiency of, v 277; steamboat inspection rules, iv 232; steam consumption in various types, x 208; efficiency, terms of, x 517; heat losses, xi 949; high speed, self-lubricating, ix 689; jacket efficiency, iii 422; laws of similitude, vii 284; method of determining influence of angularity of connecting rod and weight of reciprocating parts, i 271; stresses on frames of, xv 971; *Terrible*, vii 598; thermal efficiency of, xi 949; triple-expansion, iv 718; pumping-experiments, East London Water Works, vii 215; turbine, for an Atlantic liner, xv 1254; turbine, report of board on efficiency, xv 1247; types for high pressures at sea, x 1079; variation in efficiency due to jacketing the different cylinders, iv 486; vertical, advantages of, iv 725; vertical-inverted, stresses on frames, xv 19; weight of British naval, vii 348, 364; working at low power.....vi 592
Engines and steam cylinders, list of, *Brooklyn*, viii 761; *Columbia*, vi 33; *Indiana*, vii 662; *Iowa*, ix 478; *Maine* (old), vii 28; *Massachusetts*, viii 265; *New York*, v 68; *Oregon*.....viii 470
England: naval shipbuilding program, vii 145; navy estimates, 1896–97, viii 376; shipbuilding, 1899, xi 238; warship construction in 1900, xiii 263; new ships, 1900, xii 559; warship building in 1901.....xiv 196
English, Thos.—Calculation of horsepower for marine propulsion, viii 310; reply to discussion.....viii 317
English naval maneuvers 1888, i 169; 1889.....i 264
Enquirer, data.....x 824
Enquirer, yacht, dimensions.....viii 434
Enterprise, turnabout launch of.....ii 222
Enterprise, see *Modoc*.
Entre Rios, Arg. Rep., des., viii 383; trials, viii 804; data.....ix 141
Entropy and temperature-entropy diagrams.—Durand.....x 329
Entropy-temperature diagrams for steam and water.....viii 285
Epée, Fr., speed.....xii 499
Epée and *Pique* vs. *Durandal* and *Hallebarde*, Inboard- vs. Outboard-turning propellers.....xv 1183
Equipment and arrangement of ship-building works.....xiii 947
Equipment of tall office buildings in New York City.—Bolton.....xi 420
Ericsson, launch, vi 421; full data, x 818, xiii 1082; trials, vi 793; accident to, vii 572; steaming radius.....xiii 58
Ericsson compound engine and Belleville boiler.—Isherwood.....ii 445
Ericsson surface condenser and evaporator, report on, xi 82; tests, 1847.....xiii 343
Erne, Br., trials.....xvi 259, 347
Ernest Bazin, mer. str., des. and launch.....viii 870
Ernest Simons, mer. str., Belleville boilers.....viii 153
Ernest Woermann, mer. str., data.....xii 1122
Ersatz-Freya, Ger., see *Freya*.
Ersatz-Friedrich der Grosse, Ger., see *Friedrich der Grosse*.
Ersatz-Leipzig, Ger., see *Leipzig*.
Ersatz-Preussen, Ger., see *Preussen*.

Erzherzog Friedrich, Aus., launch.....xvi 679
Escape of steam through orifices, experiments.....xiii 1066
Escapette, Fr., data.....xi 800
Esmeralda, Chile, launch, viii 385; data, ix 142; compared to *Kléber*, xiv 1255
Espadon, Fr., launch.....xiii 1095
Esperanza, mer. str., des.....xiii 312
Espiégle, Fr., des., vii 173, xi 1103; trials, xiii 1107, xiv 206; boilers, Babcock & Wilcox.....xiii 772, xvi 920
Espora, Arg. Rep., des., and trials.....iii 285
Essex, Br., des., xiii 1104; trials, xvi 258; propellers, changes in.....xvi 261
Essex class, Br.....xii 1101
Ethel, yacht, propeller trials.....v 302
Etna, Fr., paddle steamer, trials.....iv 580
Ettrick, Br., trials.....xvi 259, 346
Etruria, It., progressive trials.....viii 198
Eugenia, see *Huntress*.
Eugénie, yacht, launch.....ix 212
Eureka (Clearfield, Pa.), semi-bituminous coal, analysis.....x 113
Europa, Br., des., vii 418; note, vii 814; launch, ix 414; des. and trials, x 846; trials, xi 322, 243; refit.....xiv 955
Euryalus, Br., launch and des., xiii 773; trials.....xvi 258
Evans, John.—Influence of copper on steel rails and plates.....xiii 678
Evaporation and efficiency Purdue locomotive.....xiii 92, 97, 98, 101
Evaporation, effect of circulation in water-tube boilers on, xii 194; experiments in connection with, vii 486; influence of rate of combustion on, in boilers of *Cushing*, vi 683; in water-tube boilers at varying angles of tubes, viii 481; of various coals.....xi 104
Evaporating plant, *Iris*, test, xi 889; "Lillie" multiple-effect, Dry Tortugas, tests, xii 85; *Rainbow*.....x 792
Evaporating tubes, Niclausse boiler.....xiii 380
Evaporative efficiency: of a Babcock & Wilcox boiler, test to determine, vii 694; French briquettes.....vii 578
Evaporative test: Almy water-tube boiler, ix 135; Babcock & Wilcox boiler, *Nebraska*, xvi 133; boilers of the *Hermione*, vii 151; Belleville boilers.....vii 791
Evaporator and surface condenser, Ericsson, report on, xi 82; test, 1847.....xiii 343
Evaporator explosion, *Resolution*, Br.....vi 173
Evaporator plant for repair ships.....xiv 1068
Evaporators: vii 486; Baird, i 285; Blair, vii 492; coil, tests of efficiency, i 287, 289, 291; *Denver*, test of removal of coils, xvi 93; French naval regulations for size of, vii 793, viii 382; location and service defects, xiv 15; Kirkaldy, vii 491; Maudslay, vii 492; Morison, vii 492; Mudd, vii 492; new forms of, Baird, ii 495; No. 4, type B, horizontal, test of, viii 95; Quiggin, vii 491; Raynor, vii 491; tests, ii 505; tests under various conditions of supply and discharge, vii 494; Weir, vii 490; Yaryan.....vii 493
Evolution of the destroyer.....xiv 580

Ewing, Professor of Engineering, University of Cambridge.—Trials of Parson's turbines.....v 900
Examinations for naval cadets, British.....xv 166
Examinations of Engineer Officers for promotion, Navy Regulation circulars Nos. 52–53, i 93–95; superseded by Nos. 109–110.....iv 462, 468
Examinations proposed for engineers in merchant service.....iv 239
Exe, Br., trials.....xvi 259, 341
Exmouth, Br., launch, xiii 1111; trials.....xiv 952, 1248, xvi 260
Expander, tube, Burton plastic pressure.....xiii 208
Expanding tubes by steam and electricity at the Yarrow works.....viii 589
Expansion engines, formula for diameter of cylinders for successive....i 147
Expansion of tubes, water-tube boilers.....x 632
Experience with destroyers.....xiii 460
Experimental apparatus for testing ships' models at Barrow, viii 788; English's arrangement.....viii 310
Experimental comparison of a single cylinder engine with a triple-expansion engine.—Isherwood.....v 271
Experimental station and engineer school, need of.....vii 449
Experimental tanks, xv 967; for Russia.....v 194
Experimental work for repair ships.....xiv 1036
Experiments in connection with evaporation.—Morison.....vii 486
Experiments on spiral springs.....xiv 255
Experiments on the arrangement of the surface of a screw propeller.—Walker, v 300; discussion: Froude, v 317; Thornycroft, 319; Barnaby, 320; Dunell, 321; Kennedy, 322; Reply to discussion.....323
Experiments on the Belleville boiler in the steam yacht *Shearwater*.—Isherwood.....ii 484
Experiments on the compression of steam in the clearance space.—Dwelshauvers-Dery.....x 641
Experiments on the double-screw, steel, ferry boat *Bergen*.....ii 251
Experiments on the effect of the direction of turning of twin screws.—Froude, x 485; discussion: Duncan, x 490; Gray, 491; Watkins, 491; White, 491; Thornycroft, 492; Barnaby.....492
Experiments on the escape of steam through orifices.....xiii 1066
Experiments on the flow of steam through pipes.....xi 193
Experiments on the outflow of steam.—Guthermuth-Wachsmann.....xvi 564
Experiments, red-hot furnace crown.....iii 223, 431
Experiments to determine the causes of steam pipes explosion on board German naval vessels.—Translation, Wachsmann.....vii 37
Experiments to determine variation in efficiency due to jacketing the different cylinders of a triple-expansion engine.....iv 486
Experiment to determine the economic vaporization of Georges Creek Cumberland Coal, under conditions of actual practice on board the *Dolphin* in port.—Baird.....vii 329
Experiments upon the durability of different metal coatings immersed in sea water.....x 781
Experiments with an air-lubricated journal.—Kingsbury.....ix 267

Experiments with basic steel.—White, iv 432. Discussion: Gilchrist, iv 442; Cooper, 442; Snelus, 443; Riley, 445; Hickman, 446; Dyer, 446; Riley, 447; Martell, 447; Bell, 449; Ellis, 450; Wrightson..... 450
Experiments with condenser tubes and boiler tubes by Yarrow & Company.....xiv 535
Experiments with induced draft and hot air in, boilers fitted with "Serve" tubes and retarders.....v 828
Experiments with liquid fuel.....xiv 580
Experiments with Orvis system for increasing vaporization of boilers and preventing smoke in furnaces.—Isherwood.....iii 295
Experiments with the Belleville boiler with marine machinery.—Blomberg .....iii 119
Experiments. See also Tests.
Explosions: boilers, vii 64; boiler, *Adler*, Aus., xii 197; *City of Trenton*, xiii 1078; compressed air, x 193; *Daring*, Br., xiii 733; *Sarrasin*, Fr., vi 166; torpedo boat *Aquila*, It., vii 605; evaporator, *Resolution*, Br., vi 168; oil fuel, *Geo. W. Loomis*, xvi 1273; steam pipe, *Aréthuse*, vi 785; *Brandenburg*, Ger., vi 416; steam pipes, German naval vessels, experiments to determine causes, vii 737; list of, on merchant steamers.....vii 535
Explosives, high.....xii 223
Exports of iron and steel, U. S.....xii 500
Exposition of the mode in which water is affected by a body moving in it.—Isherwood.....i 97
Express, Br., note, viii 622, ix 173; launch, x 225; trial data, xiii 774; trials, xiv 208; speed.....xiv 324
Express passenger steamers for the lakes.....v 238
Extinction of wrought iron.....xi 204
Extract from address of the President of the Institute of Marine Engineers.—Durston.....vii 779
Extrusion, production of metallic tubes by.....xi 40
Extrusion process for alloys.....xv 203

F

F, Ger., launch.....vi 808
Factories, electric transmission in.....xii 402
Factors of safety for marine boilers and engines.—Key.....vii 794
Failure of a cast steel piston on the U. S. S. *Charleston*.....vii 789
Failure of metal structures from fatigue.....v 1026
Failure of navy boilers, Br.....iv 496
Failure of steel castings for U. S. S. *Maine* (old) and *Cruiser No. 11.*—Carr.....iv 83
Failure of propeller shafts, increasing frequency of.....xi 403
Failures, Engine.....x 1107
Fairburn, William A.—Steam yacht, *Wacouta*.....xiv 1151
Fairfax, mer. str., trials, vii 177; duplicate of.....vii 176
Falcon, Br., trials.....xii 838, xiii 271
Falls of Inversnaid, mer. str., data of quadruple expansion engines, etc., i 80

Falling speeds for short distances.....xii 211
Fall River line, new steamer for, des.....iv 848
Fame, Br., data and des., vii 820, viii 182; launch, viii 400; des. and trials, ix 419, x 226; coal consumption.....ix 173
Fan blowers.—Dowst.....iii 473
Fans, centrifugal, design and testing.....ix 293
Fantôme, Br., data, xi 1103, xiii 489; coal consumption, xiv 310; boilers.....xvi 920
Farragut, torpedo boat *No. 11*, launch, x 827; full data, x 818, xiii 1082; speed, x 1174; trials.....xi 232, 892
Fast ocean steamships.—Elgar.....v 808
Fast scout, design for.....xiii 412
Fast ships of various powers, 1891–1901.....xiii 869
Fast small yachts.....v 249
Fast time of Atlantic steamers.....iv 494, 792
Fatigue of metals.....x 475
Fauconneau, Fr., des., x 261; speed.....xii 839
Faults of steels and their causes.....xiv 178
Fauveau, L.—The Belleville boiler.....xvi 383
Fauvette, yacht, des. and speed.....vi 440
Favorite, mer. str., triple-screw, des.....vi 438
Fawn, Br., launch.....ix 420
Fearless, Br., speed.....xiv 312
Fearless, see *Iroquois*.
Feathering paddle wheels *Etna*.....iv 580
Feed and circulating water, measurement by chemical means.....viii 517
Feed pipes, Weir's pressure regulator for.....viii 815
Feed pump, tests.....xiii 722
Feed regulators: automatic, Thornycroft, vi 790, x 518; on *Speedy*, vii 421; Belleville, on *Wild Duck*, vii 94; Reed, on *Porcupine*, viii 398; Yarrow, viii 590, 792; *Maine*, omission recommended.....xv 965
Feed-water: boiler, analysis for scale ingredients, x 1117; chemical measurement of viii 517; French naval regulations concerning lime in, vii 407; losses of, vii 486; loss of per day, U. S. S. *Minneapolis*, x 9; marine boilers, two methods of introducing, v 984; salt, for Yarrow express boilers, ix 388; tests of.....x 6
Feed-water heaters: iv 398; arrangement, xiv 12; Gilmour's, v 578; marine, Worthington, v 342; Mudd's, on *Inchmona*, viii 653; novel arrangement in water-tube boilers, x 409; when use of, is advantageous, i 158; Yarrow's.....x 409
Feed-water heating.—Kinkaid, iv 393; high temperature, Peck Wheeler system.....v 196
Feiseen, launch, des.....v 763
Fei Ying, torpedo cruiser, China, launch, vii 811; des.....viii 162
Felicia, yacht, des.....x 614
Felicia, see *Uncancomuck*.
Ferrand, L.—The battle of the Yalu and its effect on the construction of warships.....viii 370

Ferret, Br., des. and trials, vi 613, xi 328; training engineers.....vii 821
Ferrules, for marine boiler tubes, v 328, 449, vi 673; new type in the British Navy, v 715; success of.....iv 837
Ferryboat *Bergen*, experiments on.....ii 251
"Field" tubes, Niclausse boiler.....xvi 1164
Fieramosca, It., trials.....ii 236
Filine, Rus., trials.....xiv 683
Fillets and round corners on modern machinery castings.....xi 1010
Filters.....v 577
Fine copper, production of in 1898.....xii 523
Finland, mer. str., engines.....xiv 369
Fire-cracks in brass, relation of bismuth to.....x 1069
Fires, local peculiarities in water-tube boilers.....x 634
Firing of furnaces, time indicators for.....xvi 1291
Fire-proofing wood for ships.....xii 223
Fire surface of boilers, overheating.....ii 201
Fire test, nickel and mild steel boiler tubes.....xi 635
Firing water-tube boilers, requirements for efficiency.....xv 929
First battle between modern armorclads.....x 746
First class battleships, Br.—White, vi 464; further experience with.....vii 538
First class torpedo gunboats, Br., des.....iii 598
First U. S. naval steam launch.....ix 133
Fish Commission steamer *Albatross*.....vi 497
Fisher, Clark.—Obituary.....xvi 374
Fish Hawk, new crank shaft brasses.....i 174
Fish Hawk, auxiliary navy, x 536; data.....x 824
Fits, shrink and force.....xi 106
Fittings and shops for repair ships.....xiv 1071
Fitting up the crank shafts of the U. S. S. *Newark*.—Engard.....iii 9
Fitting up a solid crank shaft.—Smith.....iii 328
Fitts, Prof. James Henry.—Obituary.....v 1100
Fitzgerald, C. C. P., Rear Admiral, R. N.—Design for a fast scout, xiii 412; Discussion, watertight doors.....viii 338
Flach, Emil.—Obituary.....v 1100
Flamberg, Fr., data.....xi 800
Flange gaskets, materials.....xiv 9
Flanges for copper pipes, standard dimensions.....iii 421
Flanging boiler plates.....v 895
Flanging heat for steel plates.....xi 765
Flat heads, distortion and resistance of.....x 662
Fleet auxiliaries.....xiii 469, xvi 957
Fleet cruisers, 1894, Br., des.....vi 804
Fleming and Ferguson boilers.....vi 358
Fleurus, Fr., launch, v 520; repairs, vii 173, new boilers, viii 626; note, ix 425
Flibustier, Fr., des., vii 825; preliminary trials.....vii 430
Floating derrick at Cramp's.....v 477
Floating coal depot.....xvi 693

Floating docks: xiii 193; Algiers, La., xi 988, xiii 716, 1080; test, xiv 279; Cavite, xv 17; strategic value, xv 472; Port Mahon, xiii 713; South Brooklyn, xii 457; Stettin, x 283, 677; two large.....ix 780
Floating dry docks, their military possibilities and value.—Ford.....xv 1
Flora, Br., trial, vi 605; machinery data, viii 568; refit, xiv 1248; grounding of.....xvi 347
Florida, Act of Congress, x 813; bids, x 1169; launch, xiv 297; contract trial, xv 546; comparison of monitor performances.....xv 823
Flow of steam through pipes, experiments on.....xi 193
Flue gases: analyses, xi 299; boiler trials, xii 49; Niclausse boiler tests, x 114; *Ville de Douvres* trials.....iv 416, 548
Flue gases, sampling in boiler testing.....x 135
Flues, Purve's ribbed.....iii 452
Fluid-compressed forgings compared with bored.....x 1016
Flying Fish, Br., launch, ix 420; speed, ix 807; coal consumption.....x 571
Flywheels: on air pumps, vi 527; cast-iron, bursting of.....xi 212
Foam, Br., data, vii 820; des., viii 182; launch.....viii 844
Following wave.....i 20, 34
Fontaine, G., Chief Engr., French Navy.—The Rational Lubrication of Marine Engines, extracts.....iii 571
Foote, torpedo boat, *No. 3*, des. and contract trials, ix 655; full data, x 818, xiii 1082; repairs, x 220; steaming radius.....xiii 58
Forban, Fr., des., vi 429; launch, des. and trials, vii 825; comparative data.....ix 35
Forbes, W. D.—Interchangeability of units in machinery.....xii 104
Forbin, Fr., trials, i 180; des., i 360; speed, iii 601; defects in, iv 315; performance data.....v 504
Force and shrink fits.....xi 106
Forced-draft blowers, service defects.....xiv 8
Forced-draft boilers, combustion chambers, and tube sheets for.....iv 787
Forced-draft: (artificial), effect on boiler construction, iii 349; comparison closed ash-pit and closed firerooms, iv 706; comparison of closed ash-pit and closed fireroom systems, Babcock & Wilcox boiler, xvi 133; compressed air system for, i 330; construction of boilers adapted to, iii 229; Howden system, x 206; on *Chicora*, iv 865; on *Harvey H. Brown*, vi 816; on *Pomona*, trials vii 436; methods of applying i 155; new system, xi 754; closed stoke hole, Howden, Ellis & Eaves, and closed ash-pit systems compared, viii 140; systems compared.—Thom, viii 140; tube sheets for boilers with.....iv 787
Forced-draft trial of the U. S. S. *Raleigh*.—Roelker.....viii 298
Forced lubrication for high-speed engines, advantages of.....ix 699
Ford, John D., Rear Admiral, U. S. N., retired.—Description and trials of U. S. destroyers *Truxtun*, *Whipple* and *Worden*, xiv 1083; floating drydocks, their military possibilities and value, xv 1; *Tingey*, general description, contract trial, xvi 50; corrosion of boiler tubes.....xvi 529
Forel, Rus., speed.....xiii 793
Fore River boilers, *Lawrence*, *Macdonough*.....xiii 1082
Foresight, Br., scout, xvi 985; launch.....xvi 1325

Forges, down draft.....xii 524
Forging press.....xii 520
Forgings: defects in, xii 134; hollow, xiv 1219; marine shafting, notes on, xiv 226; *Petrel's* crankshafts, iii 3; steel, ix 101, xiv 167; cost of, i 205; crank shaft, iii 1; hollow, ix 84; hollow, fluid-compressed and bored methods compared, x 1016; manufacture, tests and defects.....xv 615
Form of bow of vessel, effect on speed and wave.....i 98
Formidable, Br., launch, x 1179; data, x 861, xi 241; des., xi 240; inturning screws, xiii 1082; trial.....xiii 774, xiv 206
Formidable class, Br., trials.....xi 320
Formosa, yacht, des.....vi 441, 644
Formula for the diameter of cylinders for successive expansion engines.—Gow.....i 147
Formulae for finding the turning effort on the crank shaft of an engine.—Bryan.....vi 334
Formulae for proportioning riveted joints and calculating the width and thickness of butt straps for steel boilers.—Schell.....iv 403
Formulae for the strength of seams, stays and braces for cylindrical boilers.—Canaga.....viii 269
Formulae, Lloyd's, for Fox's corrugated furnaces.....iv 257
Foros, yacht, dimensions and speed.....vi 440
Forsyth, Robt.—Discussion, speed trials of fast ships, ii 89; discussion, effect of auxiliaries on economical speed and coal endurance, v 104; care of marine boilers, v 574; discussion, air pumps.....vi 538
Forte, Br., engines, iii 129; des.....iv 118
Forth, Br., des.....i 265
Forward, Br., scout, xvi 985; launch.....xvi 1324
Fothergill, J. R.—Discussion, induced draft and hot air, combined, in boilers fitted with "Serve" tubes and retarders, v 839; marine boilers, particularly with reference to efficiency of combustion and higher steam pressures.....viii 764
Foudre, Fr., torpedo depot ship, iv 126; des., xvi 699; launch, vii 76, 824; note, viii 403; trials.....ix 176
Foul bottom, influence on speed, *Medusa* class, Br.....ii 420
Foul condition of ship's bottom, increase of horsepower for a given speed, due to.—McFarland.....i 73
Foundry and rolling mills for manufacture of aluminum at Milton, Staffordshire.....x 755
Foundry practice: cylinders, molding in loam and casting, *Cincinnati* and *Raleigh*, iv 376; Bath iron works, molding cylinders in dry sand, iv 159; with copper and its alloys.—Reardon.....xvi 960
Fowler, T. P., see *Mohawk*.
Fox, torpedo boat, *No. 13*; full data.....x 818, xiii 1082
Fox, Br., des., iv 119; trials.....vi 802, xi 892
Fox's corrugated furnaces, formulae.....iv 257
Foyle, Br., trials.....xvi 259, 342
Fracture of a crank pin on the German Lloyd steamer *Lubeck* on her trip from Apia to Sydney.....iii 456

Frahm, Hermann.—Recent investigations concerning dynamical action in shafting of marine engines, with special reference to synchronous torsional vibrations.....xiv 721
Framée, Fr., sinking of.....xii 1106
Frames, engine, of plate steel, for Cruiser *No. 11*, (*Marblehead*).....iv 90
Frames of vertical steam engines, stresses on.....xv 971
Framework, wood and iron, painting.....v 713
Framing of engines, xiv 2; weight per I.H.P. on some British vessels, viii 565
France: shipbuilding, program 1892, iv 311; 1897, ix 130; 1898, x 257; 1899, xi 524; 1900, xii 253; navy, 1901, xiv 659; 1901.....xiii 495, 1048
France: conversion and re-armament of ships, xiii 618; naval boiler question, xv 449; navy, water-tube boilers, xii 743; submarines, note on...xiv 1231
France, sailing vessel, dimensions.....iv 290
Francesco Ferruccio, It., launch and data.....xiv 341, 979, 1260
Frank Rockfeller, mer. str., des. and launch.....viii 425
Fränzel, Curt.—Radial valve gears, translation.....iii 525
Franz Josef I, Aus., des. and trial.....iii 136
Frauenlob, Ger., data, xiv 674; trials.....xvi 358
Freight steamers for the American line.....v 757
Freight steamers for the Minnesota S. S. Company.—Janson.....iv 129
Free Lance, yacht, des.....vii 628
Free Lance, auxiliary navy, x 536; data.....x 824
Freeman, Edward R., Lt. Comdr. U. S. N., retired.—The contract trial of the U. S. S. *New York*, v 613; discussion, experimental station and engineer school, vii 473; obituary.....xvi 717
Fremantle, Sir E. R., Admiral, R. N.—Discussion: Water-tight doors, viii 339; discussion, conversions and re-armaments of ships, xiii 622; discussion, torpedo-boat destroyers.....xiv 407
French boilers for a British vessel.....v 1031
French Navy: xiv 533; early Belleville boilers, xvi 439; later Belleville boilers, xvi 444; maneuvers, iii 599; new cruisers for, of *Dupuy de Lôme* type, iv 841; Niclausse boiler installations, xv 1172; program, 1892, iv 843; 1893, iv 521; 1894, v 749; 1905, xvi 1009; warship building in 1895, vii 146; new construction, 1904, xvi 348; regulation for sizes of evaporators, vii 793; changes in, viii 382; tubulous boilers in, vii 365; vessels, conditions for contract trials.....iv 481
French view of water-tube boilers.....xiv 536
French torpedo-boat *Chevalier*, des. and trials.....vi 585
Freshly hewn or green wood as fuel.—Moritz.....xii 100
Freya, Ger., dimensions, vii 828; triple screws, viii 551; details, viii 556; boilers, ix 815; speed, xi 255; note, xi 1110; speed trials, xiii 294; trials and boilers, xiii 501; coal consumption and boiler data, Niclausse.....xiv 117
Friant, Fr., preliminary trial, vi 807; trials, vii 171; official trials and alterations, vii 429; Niclausse boiler, vii 408, viii, 375; compared to Belleville and D'Allest, vii 408; weights of machinery.....vii 409
Friction and viscosity of metals.....xii 368, 927

Friction: of elastic gears, xii 374, 927; hulls, vi 259; locomotive slide valves.....xi 478
Frictional resistance of bearings.....ix 104
Friedrich der Grosse, Ger., triple screws.....viii 551
Friedrich der Grosse, mer. str., data, viii 861, ix 441; speed.....ix 201
Friesland, Hol., des., vii 829; launch, ix 182; trials, x 263; Yarrow boilers.....viii 406, 792, x 887
Friesland, mer. str., des.....i 363
Frigate *Constitution*.—Hollis, book received.....xii 1132
Frithjof, Ger., launch, iii 605; coal consumption and boiler data.....xiv 116
Frolic, data.....x 824
Froude, R. E.—Discussion, experiments on the arrangement of the surface of a screw propeller, v 317; discussion, calculation of power for marine propulsion, viii 316; experiments on the effect of the direction of turning of twin screws, x 485; reply to discussion, x 492; rotation of propellers, xvi 119; water resistance to motion of ships.....xvi 306
Fry, Alfred Brooks.—The necessity of engineer divisions in the naval militia.....viii 303
Fuel: analysis, Niclausse boiler test, xvi 1069; Borneo oil, xi 446; economy, increase during ten years, xiii 827, 839; economy of the British "B" fleet in the naval maneuvers of 1901, xiii 1028, freshly hewn or green wood, xii 100; garbage for, xii 185; gas as, xii 487; liquid, (see liquid fuel) xv 231; experiments, xi 720; fire from, in *Kaiser Friedrich III*, from damage to pipes in grounding, xiii 637; progress during ten years, xiii 835; oil apparatus, successful test, xiii 216; dangers from, xiii 469; experiments on hydraulic life-boat *Queen*, x 385; for boiler testing, x 136; in German Navy, xvi 1018; on battleships, xvi 693; specific gravity and weight, xv 234; repair ships, xiv 1067; use on Pacific Coast, xiv 262; petroleum briquettes, xiv 932; petroleum in metallurgy, xii 1065; pulverized, xi 1068, xiii 168; pulverized coal, xii 1075; various, testing boilers with.....x 129
Fuerst (*Fürst*) *Bismarck*, mer. str., des. and data.....iii 610, iv 102
Fuji, Jap., launch, viii 419, trials, ix 428; des.....xiv 345
Fuji Yama, Jap., des.....vi 632
Full power run of the U. S. S. *Olympia*.....viii 581
Full power trials of the British Mediterranean fleet.....viii 795
Fulton, U. S. S., her design, construction and capacity.....x 422
Fulton, launch., xiii 767; gasoline explosion, xiv 614; test.....xiv 298
Function and design of cruisers.....xvi 1274
Fung-Shun, mer. str., trials.....vi 590
Funnel Gas Analyses. (See Flue Gas Analyses and Analyses.)
Funnels, high, for *Brooklyn*.....v 175
Furious, Br., des., vii 419, ix 163; mentioned with *Vindictive*, viii 170; note, vii 815; trials, x 859, xi 243; coal consumption, x 565; Bantry to Portland, Gibraltar to the Downs, and Las Palmas to England.....xii 738
Furnace crown, red hot, experiments.....iii 223, 431
Furnaces: boiler, gauging the circularity of, x 1074; corrugated, Brown's, improved type, tests, xv 182; corrugated, collapse of, ix 394; corru-

gated, partial collapse of, vii 131; factors of safety, v 30; Farnley, Fox, Holmes, Purves, v 24; Morison, v 27; fittings, service defects, xiv 8; Fox's corrugated, v 27; formulae, iv 257; marine boiler, v 11, 413; open-hearth, steel, xv 127; proposed rules for strength of, for steamboat inspection service, iv 223; tests, various forms.....v 38
Furnessia, mer. str., data.....vi 162
Furor, Sp., launch, viii 856; trials.....ix 189
Fürst Bismarck, Ger., data, xiii 295; coal consumption and boiler data, cylindrical.—Schulz.....xiv 117
Fürst Bismarck, mer. str., data, vi 162; des. and trial.....iii 289, 610
Further experience with first-class battleships, Br.—White,.....vii 538
Further trials of the Belleville boilers of the *Sharpshooter*, Br.....vi 591
Fusiyama, Jap., report on trial of, ii 340; trial data.....iv 426
Future of acetylene as an illuminating agent.....xi 226
Future of maritime commerce.....x 1104

G

G 14, Fr., data.....xiii 1093
G, Ger., named *Frauenlob*.....xiv 674
G, *H* and *I*, Ger., data.....xiv 357
G 108, Ger., launch.....xiii 1098
Gagara, Rus., data, xiv 364; trials.....xiv 683
Gage for testing the circularity of boiler furnaces.....x 1074
Gage, Howard, P. A. Engr., U. S. N.—Discussion, trial trips and the lessons to be learned from them, iii 166; the contract trials of the U. S. S. *Monterey*, v 115; evaporative efficiency of French briquettes, vii 578
Gaging the circularity of boiler furnaces.—Messenger.....x 1074
Galatea, Br., breakdown, i 255; defects in, i 260; des., i 265; des. and trials, iv 278; boiler data, iv 507; machinery trial.....v 743
Galilée, Fr., launch and dimensions, viii 405; data.....viii 627
Gallia, mer. str., data.....vi 162
Galveston, data.....xi 508, 1081
Galvanic action, boilers, iii 183; copper sheathing.....xii 1061
Galvanic series of alloys.....xi 351
Galvanizing plant and electrolytic process used by the Naval Construction and Armaments Company.....viii 792
Gangut, Rus., dimensions.....iii 606
Gantry, travelling, at Harland & Wolff's.....x 525
Garbage for fuel.....xii 185
Garibaldi, Arg. Rep., des., viii 605; trials, viii 803; accident on.....xii 1047
Garibaldi, It., launch, xi 802, 817; speed, xiii 299; des., xiii 504; trials, xiv 340; compared to *Kléber*.....xiv 1255
Garibaldi and *Varese*, comparative boiler trials.....xiv 980
Garrison, F. Linwood.—Lectures on alloys, extracts from.....iii 489
Gas: analysis, Niclausse boiler test, xvi 1069; and oil engines, early types, x 165; as fuel, xii 487; blast furnaces, power from, x 1148; chimney, analysis, xvi 983; engines, xii 1083; tests, British, xi 1038; drive in a

machine shop, xi 450; for operating electric plants, xi 504; for a screw scow, vi 415; for shop driving, xi 991; *Protector*, xv 1224; using producer gas.....xi 113
Gas Engine & Power Company's naphtha yacht, des.....viii 216
Gas jet tests.....x 408
Gas motors for small vessels.....v 884
Gas producer, direct utilization in Europe.....xi 111
Gases, liquefied, boiling points at ordinary atmospheric pressure.....xi 506
Gases, waste, of blast furnaces, as fuel for boiler testing.....x 138
Gasket material, pneumatic system, *Terror*.....ix 26
Gaskets, pipe-flange, materials for.....xiv 9
Gasoline engines.....xi 768
Gasoline engines for Holland submarine torpedo vessels *Nos. 3 to 8*.—Saltar.....xiii 144
Gasoline motors for small vessels.....v 886
Gauge glasses, composite, Sholt and Gens.....v 192
Gaulois, Fr., launch, viii 848; trials, x 877; comparative trials.....xii 254
Gazelle, Ger., trials, xiii 294; boilers, xiii 501; coal consumption and boiler data, Niclausse, xiv 117; data.....xiv 332
Gear teeth, wear of.....xii 205
Gears, elastic, inertia stresses.....xii 329, 603, 913
Gears, radial valve.....xii 757
Gearing.—Discussion, watertight doors.....viii 342
Geddes.—Discussion, marine boiler furnaces.....v 417
Gedeh, mer. str., launch and des. quadruple-expansion engines.....iv 864
Gedney, auxiliary navy, x 536; data.....x 824
Géfion, Ger., coal consumption and boiler data.....xiv 116
Gehre's superheater, des. and tests.....viii 351
Geier, Ger., des. and trials, viii 631; speed, viii 192; coal consumption and boiler data.....xiv 116
Geiser, Den., Thornycroft boilers of, des., ii 236, v 163; boiler weights, v 169
General Admiral Apraxine, Rus., dimensions, vii 839; launch...viii 202, 637
General Baquedano, Chili, launch.....x 840
General Mitra, Arg. Rep., data.....xiv 307
General Nerino, U. S. of Colombia, des.....viii 202
General Pel, mer. str., trials.....vi 590
General Roca, Arg. Rep., data.....xiv 307
General San Martin, Arg. Rep., des.....x 830
General notes on turbine installations.—Canaga-Janson.....xvi 1111
General station bill, Engineer division.....xvi 1220
Generators and motors for electric power transmission.....xiv 817 1109
Generators, power plant, Navy Yard, N. Y.....xiii 987
George's Creek, Cumberland, coal tests of on *Dolphin*.....vii 329
George Stephenson, mer. str., launch and dimensions.....viii 864
George N. Orr, mer. str., launch.....viii 427
Georgeé Pobeidonosets (George the Victorious), Rus., des., iv 129; note, launch, viii 420; des. and trials.....viii 635
Georgia, data.....xii 235, 529

Georgic, mer. str., des.....vii 625
German: men-of-war, development in design and construction of, viii 543; naval construction, excellence of, xv 513; naval engines, recent investigations, xiv 18; naval force, iii 466; naval vessels, cylinder ratios, xiv 18; experiments to determine cause of steam-pipe explosions on, vii 737
German Navy: 1901, xiv 672; program, 1902, xiv 971; boiler tube tests, xi 492; Niclausse boiler installations, xv 1173; steam cutter for, xiii 423; water-tube boilers, xii 746.....xiv 74
German, mer. str., trials.....vi 590
Germanic, mer. str., record, new triple-expansion machinery.....vii 626
Germany and submarine boats.....xiv 578
Germany, cost of construction naval vessels, 1900, xii 840; marine turbines for navy, xv 603; naval construction.....xvi 356
Gibraltar, Br., launch and des., iii 134, iv 534; des. and trials, v 731, 738; details.....v 226
Gibraltar, new docks.....xiii 1081
Gigantic, mer. str., des.....iv 856
Gilbert, C. Humphrey.—Discussion, cylindrical *vs.* water-tube boilers..vi 409
Gilbert, William.—The design and testing of centrifugal fans.....ix 293
Gillmor, H. G., Naval Constructor, U. S. N.—The United States torpedo boats *Talbot* and *Gwin*, x 493; the U. S torpedo boat *Morris*, x 502; contract trial of the U. S. protected cruiser *Albany*.....xii 281
Gilyak, Rus., launch.....ix 824
Gipsy, Br., launch, ix 421; speed.....x 573
Giralda, yacht, des., vii 196, viii 432; winner of Bennett race.....vii 445
Giuseppi Garibaldi, It., see *Garibaldi*.
Glacier, data, x 824; steaming radius.....viii 58
Gladiator, Br., des., vii 419; launch, ix 165; trials, xii 246; mentioned with *Vindictive*.....viii 170
Glasgow, mer. str., trials.....vi 590
Glass revealer for studying condensation in steam engine cylinders, etc.....xii 998
Glatton, Br., des.....i 266
Gleaner, Br., trials, iv 120; boiler accident.....iv 305
Globe, mer. str., des.....vi 830
Gloire, Fr., launch.....xii 838
Gloire and *Condé*, Fr., trials.....xvi 354
Glory, Br., des., viii 378; note, viii 807; data, ix 408; des., xi 519; trials, xiii 274
Gloucester, auxiliary navy, x 535; data, x 824; steaming radius.....xiii 58
Gloucester, mer. str., launch, des. and trial.....v 758, 1086
Goa, mer. str., trials.....vi 590
Golden Gate, mer. str., launch.....ix 403
Goldsborough, torpedo boat *No. 20*, full data, x 818, xiii 1082; trials, xiii 473, trials and accident, xv 778; machinery accident, xiv 1235; repairs.....xiii 769
Goldschmidt, Dr. Hans.—Production of high temperatures by burning aluminum.....xvi 319

Goliath, Br., launch and des., viii 378, 807, x 567; trials, xii 246, 248; note.....xiii 807
Goodall, F. C.—Whaleback steamers.....iv 453
Good Hope, Br., launch and des., xiii 484, des. and trials, xiv 619, 950; trial results, xiv, 1241; voyage to Cape Colony, xv 259; Belleville boilers.....xvi 642
Gorgon, Br., des.....i 266
Goss, W. F. M.—Tests of the boiler of the Purdue locomotive.....xiii 70
Gossamer, Br., trials, iii 598; speed.....xiv 955
Göta, Sweden, des., iii 139; reconstruction.....xiv 692
Gothic, mer. str., des.....v 757
Goubet, Fr., data.....xii 254
Goubet, new submarine boat (1896).....viii 158
Governing high-speed engines.....ix 702
Governolo, It., des.....vi 620
Governor, Parsons' turbine.....v 904
Governor Russell, data.....x 824
Governor, steam turbine, Westinghouse-Parsons.....xiii 129 131
Gow, John L., Lt. Comdr., U. S. N.—Formula for the diameter of cylinders for successive expansion engines, i 147; discussion, effect of auxiliaries on economic speed and coal endurance, v 112; discussion, organization of the engineers' division on board a man-of-war.....xiii 940
Grace Darling, yacht, data of quadruple expansion engines, etc.....i 77
Grafton, Br., details, v 226; launch and des., iii 134, v 504; trials, v 744; coal consumption.....vii 415
Grampus, named, xii 825; launch, xiv 947; des., contract and standardization trials.....xv 584
Granada, mer. str., launch.....xi 1121
Grand Duchess, mer. str., launch and des., viii 205; des. and trials.....ix 194
Grant, data.....x 534
Graphical chart for the solution of valve-gear problems.—Durand....xiv 1141
Graphical record of progress in steamship construction.....xiv 570
Graphic method for determining and counterbalancing the centrifugal action of the connecting rod.—Canaga.....ii 433
Graphic method for determining the influence of the angularity of the connecting rod and of the weight of the reciprocating parts of a steam engine.—Canaga.....i 271
Grasshopper, Br., des., i 171, 265; trials.....i 261
Grates, ordinary *vs.* shaking.....xiv 7
Grates of water-tube boilers.....x 634
Grattan, W. S., mer. str., data.....xiii 320
Gravell, J.—Discussion, marine boilers, efficiency of combustion and higher steam pressure.....viii 773
Graving dock, Stettin.....x 677
Gray, McFarlane.—Discussion, transmission of heat through tube plates, v 460, 462; discusssion, Yarrow's feed-water heater, x 419; discussion, recent trials of the cruiser *Diadem*, x 437; discussion, effect of direction of turning of twin screws.....x 491

Grease, loss of boiler efficiency due to deposit of.....vii 782
Grease extractors.....v 577
Great Dry Dock at Glasgow.....x 521
Great Eastern, mer. str., dimensions and data.....iv 102, vi 162
Great Eastern and *Campania*, mer. strs., compared, v 810; speed.....v 815
Great Lakes, commerce on the.....v 153
Great Lakes of North America.—Ely.....v 140
Great Lakes, U. S., cost of transportation on.....x 734
Great Western Railway Company's new steamers.....viii 868
Grecian, mer. str., data and des.....xii 264, xiii 312
Gremyastchy, Rus., des.....iii 605
Green wood as fuel.....xii 100
Greene, Albert S., Chief Engr., U. S. N.—Obituary.....viii 435
Greene, S. Dana.—Electricity on board ships, xi 411; obituary.....xii 273
Green's thermometers.....viii 121
Gresham, contract trials, ix 253; auxiliary navy, x 536; data.....x 824
Greyhound, Br., trials, xiv 208; coal consumption, xiv 323; experiments.....xvi 306
Griffin, R. S., Lt. Comdr., U. S. N.—Discussion, "Some Lessons from Samoa," i 218; discussion, tubulous boilers, ii 206; discussion, engine-room signals, iii 449; the contract trials of the U. S. S. *Bancroft*.....v 365
Griffith, Edwin.—Comparison of the propellers of some U. S. Navy ships.....iv 400
Gromoboi, Rus., note, x 895; launch, xi 803; horsepower, xiii 304; compared to *King Alfred*, Br.....xiv 314
Grooves, for rope drives.....xi 135
Gross, F.—Discussion, induced draft and hot air, combined, in boilers fitted with "Serve" tubes and retarders, v 843; suction draft for boilers, Ellis & Eaves.....vi 744
Grosser Kurfurst, mer. str., des.....xii 849
Grounding of the German battleship *Kaiser Friedrich III*.....xiii 632
Guardia Marina Riquelme, Chili, launch, viii 611; trials.....ix 143
Guelph, mer. str., des.....vi 832
Guichen, Fr., note, vii 825, x 884; speed.....xii 253, xiv 667
Gümbel, Herr L.—Torsional vibrations of shafts.....xiv 432
Gunboat *No. 5*, *Machias*, launch.....iv 117
Gunboats, 1,000-ton, *Nos. 5* and *6*, des., i 351; bids.....ii 408
Gunboats *Nos. 7*, *8* and *9*, bids, v 1037; contracts given, vi 176; des., v 722, 727
Gunboats, *Nos. 10* to *15*, bids.....vii 804
Gunboats *Nos. 10*, *11*, *12*, *13*, des.....vii 581
Gunboats *Nos. 14* and *15*, des.....vii 583
Gunboat for the U. S. of Colombia.....viii 841
Gunboat (Indian Govt.) light-draught, stern-wheel, for Upper Chindwin, iv 836
Gunboats, river, light-draught.....x 783
Guns, pneumatic system for, *Terror*.....ix 14
Gun test, 6-inch.....xi 1074
Gun-training motors, electric.....viii 576
Guns, Vicker's, data.....x 670

Gustave, Zédé, Fr., accumulator accident, vi 619; note.....xiii 289
Gutermuth, Prof. M. F.—Experiments on the outflow of steam, xvi 564; port areas for steam engines.....xvi 588
Guthrie, data.....x 534
Guy, Albert E.—A simple graphic method of considering the obliquity of connecting rods in valve diagrams (translation).....v 991
Guyot boilers, in navies.....xvi 292
Guyot-Du Temple boilers: compared with others, xiv 423; ships fitted with.....xiv 500
Gwin, Torpedo boat *No. 16*, des. and trials, x 493; launch, x 533; full data, x 818, xiii 1082; steaming radius.....xiii 58

H

H, Ger., data, xiv 357; launch.....xiv 675
Habsburg, Aus., launch and des., xiii 260; trials.....xiv 1238
Hackworth valve gears.....iii 535
Haddon.—Discussion, Yarrow's feed-water heater.....x 420
Hagen, Ger., repairs, xii 570, xiii 295; coal consumption and boiler data.....xiv 116
Hai, Nor., dimensions.....ix 432
Hai-Chai, China, launch.....x 225
Hai-Tien, China, launch.....x 224
Hai-Yung, China, launch.....ix 798
Haines, Hiram.—Coals of Alabama, i 118; obituary.....iii 614
Hajen, Den., note.....viii 612
Hakata Maru, mer. str., dimensions.....ix 205
Halcyon, Br., des., iv 833; boilers of class, vi 803; trials.....vi 614
Haliotis, mer. str., des., x 606; launch and des.....x 1219
Hall, Harry, Lt. Comdr., U. S. N.—Contract trial of the United States coast-line battleship *Indiana*, vii 637; contract trial of the United States seagoing battleship *Alabama*.....xii 855
Hall, Reynold T., Lt. Comdr., U. S. N.—The manufacture of open-hearth steel castings, i 185; manufacture and inspection of iron and steel boiler tubes.....ii 301
Hallebarde, Fr., note.....viii 850
Hallebarde and *Durandal* vs. *Pique* and *Epeé*, outboard- vs. inboard-turning propellers.....xv 1183
Halligan, John, Jr., Lt., U. S. N.—The naval boiler problem, xv 207; the development of the submarine in the direction of increased scope.....xv 1211
Halpin, Drewitt.—Discussion, determination of the dryness of steam....vii 318
Hamburg, Ger., progress on, xvi 357; comparison with *Amethyst* and *Topaze*, xvi 360; trials.....xvi 1018
Hamburg-American steamer.....x 1219
Hamburg-American steamers, *America* and *Kaiserin-Auguste*.....xvi 1339
Hamilton, data.....x 534
Hamilton, James.—Discussion, torpedo-boat destroyers.....xiv 407

Hammer, steam, vs. hydraulic press.....v 715
Hammering, work done in.....x 1154
Hampshire, Br., combination boilers, Yarrow and cylindrical, xiv 921; launch and des.....xvi 344
Hand and machine labor.....xii 455
Handbook of the Steam Engine.—Haeder and Powles, book received..v 1095
Handling cargo by machinery.....xiii 183
Handy, Br., launch, vii 426; machinery.....viii 393
Hannibal, steaming radius.....xiii 58
Hannibal, Br., launch, viii 612; data, vi 423; x 824; trials, x 227, xi 320; oil fuel.....xiv 642
Hansa, Ger., coal-consumption and boiler data, Belleville.....xiv 117
Harbor-defense ram *Katahdin*, authorization and data, i 236; des., ii 576; molding cylinder for, iv 159; work on, iv 295; launch and des.....v 202
Hardening extra-long stay-bolt taps.—Markham.....xiv 596
Hardening steel, surface, Harvey process.....iii 590
Hardinge, mer. str., launch, xii 1123; data.....xiii 488
Hardy, Br., trial.....viii 620
Harleck. See *Pompey*.
Harold Haarfagre, Nor., launch.....ix 183
Harrier, Br., des., iv 833; launch and des., vi 426; trials.....vi 803
Harris, William Henry, Commodore U. S. N.—Obituary.....xiii 326
Hart, Br., trial, viii 180; machinery.....viii 393
Hartford, air pump, vi 525; dock trials.....xii 237
Hartley, Geo. B.—Details of construction of a Niclausse boiler.....xiii 377
Harvard, auxiliary navy, x 536; data.....x 824
Harvey carbonizing process.....iv 512
Harvey H. Brown, mer. str., des.....vi 816
Harvey, John, Fleet Engineer, R. N.—The Royal Naval Engineer's note book.....i 89
Harvey process of surface-hardening steel.....iii 590
Hasbrouck, R. D., Lt., U. S. N.—Translation, the speed problem.....ix 29
Hashidate, Jap., des., iv 316; mention in battle of Yalu.....viii 370
Hasty, Br., trials.....xiv 208
Haswell, Chas. H.—Discussion, air pumps, vi 535; discussion, experimental station and engineer school, vii 458; reminiscences of early marine steam-engine construction and steam navigation in the United States of America from 1807 to 1850.....x 949, xi 373
Hatsuse, Jap., trials, xiii 301; des.....xiv 345
Haughton, A. D., Asst. Engr., U. S. N.—Trial of the steel cargo steamship *Winifred*.....x 982
Haughty, Br., launch, vii 823; trials.....viii 180, 397
Havel, mer. str., des., iii 288; data.....x 283
Haverford, mer. str., des.....xiii 533, 798, xiv 695
Havock, Br., des. and trial, v 655, 1056, vi 203; trials, xi 328, xiii 271; speed and power.....vii 426
Hawaiian, mer. str., launch.....xiii 313
Hawea, mer. str., trials.....vi 590

Hawk, data.....x 534
Hawke, Br., des.....iii 134
Hayes, Chas. H., Lt. Comdr., U. S. N.—Partial collapse of a corrugated furnace flue, vii 131; contract trial of the United States coast-line battleship *Massachusetts*.....viii 237
Hay, Sir J. Dalrymple.—Discussion, conversion and re-armament of ships.....xiii 629
Hazard, Br., des., iv 833; trials.....vi 426
Heads, cylindrical for boilers, development of.....iii 221
Head, Jeremiah.—Discussion, determination of the dryness of steam..vii 323
Headers, Niclausse boilers, xv 1165; construction of.....xiii 378
Heat effects on boilers.....iv 693
Heat, flanging, for steel plates.....xi 765
Heat, most intense obtained.....xi 769
Heat losses: Actual steam plant, idealized steam plant, Diesel motor, xi 397, 398, 400; in steam engines, xi 949; in smoke, iv 802; locomotive boilers, xi 493; through distillers.....xvi 105
Heat transmission, through tube plates.....v 436
Heated surfaces, clothing of, tests.....x 708
Heater, feed-water, novel arrangement in water-tube boilers, x 409; Yarrow's.....x 409
Heaters for hot-water heating.....xii 427
Heaters, steam-consumption tests, *Minneapolis*.....x 54
Heating and ventilation, mechanical, xii 1074; by hot water from central station, xii 421; electric, for ships.....viii 573
Heating surface and I.H.P., ratio used in British navy.....vii 784
Heaton, Wm. W., Chief Engr., U. S. N., retired.—Obituary.....vii 636
Hebe, Br., launch and des, iv 533; details, v 226; des. and trials.....vi 200
Hecate, Br., des.....i 266
Hecla, Br., des.....i 264
Hecla, Den., test of cellulose.....iii 466
Hector, data.....x 824
Heenan, Hammersley.—The design and testing of centrifugal fans.....ix 293
Heighington, mer. str., des., and economical voyages.....iv 864
Height of ocean waves.....xiii 201
Heimdal, Den., launch.....vi 800
Heimdall, Ger., coal-consumption and boiler data.....xiv 116
Hela, Ger., des., ix 180; coal-consumption and boiler data.....xiv 116
Helena, bids, v 1037; des., v 727, vi 176; launch, viii 160; contract trials, ix 360; broken propeller shaft, xi 900; steaming radius.....xiii 58
Henderson, Admiral, R. N.—Discussion, torpedo-boat destroyers.....xiv 408
Henderson, Alexander, Chief Engr. U. S. N., retired.—Obituary.....xiii 327
Hendrick S. Holden, mer. str., launch.....x 901
Henri IV, Fr., des., vi 427, xiv 667; dimensions, viii 187; data.....xi 800
Herbert, W. C., Lt. Comdr., U. S. N.—Contract trial of the U. S. armored cruiser *Brooklyn*.....viii 741
Hercules, auxiliary navy, x 536; data, x 824. (See *Chickasaw*.)

Hercules, Br., des., i 265; engines, iii 269; engine notes, trial of new machinery, v 220; speed and power.....vi 493
Herluf Trolle, Den., note, ix 145; launch, xi 1097; speed.....xiii 476
Hermes, Br., launch and des., ix 165, x 545; battery, ix 415; trials, xi 789, xii 246; boilers, xii 717, xvi 920; repairs.....xiii 280
Hermione. See *Hawk*.
Hermione, Br., boiler test, evaporative, vii 151; trials, vii 815; boiler trials.....xvi 458
Hero, Br., des.....i 264, 170
Hero, mer. str., des., vii 619; Babcock & Wilcox boilers.....viii 770
Heron, Br., note, x 227; des.....x 556
Herongate, mer. str., comparison of ordinary and Dickinson propellers, v 314
Herreshoff boilers, tests, ii 170; des.....ii 175
Hertag Hendrik, Hol., Yarrow boilers.....xiv 339
Hertha, Ger., launch, ix 426; boilers, ix 815; rod pressure, xiv 21; cylinder data, xiv 37; coal consumption and boiler data, Belleville, xiv 117
Herly, Br., des.....i 266
Hesperia, auxiliary navy.....x 536
Hiawatha, yacht, des., viii 214, ix 208; launch.....ix 446
Hibernia, Br., machinery contracts.....xvi 338
Hick, Hargreaves & Co.'s superheater, des. and tests.....viii 352
High explosives.....xii 223
High duty record for pumping engines.....x 1090
Highflyer, Br., des., ix 165; battery, ix 415; launch, x 859; trials, xi 789; xii 246, 563; boilers, xii 711, comparative tests.....xii 251
High nickel-steels.....xi 148
High pressure at sea with some consideration of types of boilers.—Cummins.....x 1079
High smoke pipes for *Brooklyn*.....v 175, vi 669
High-speed: engines, xiv 574; self-lubricating steam engines.—Morcom, ix 689; torpedo boats.—Schichau, iv 845; vessels, strength of.....xiv 1186
High-service pumping engines, Washington, D. C., tests.—Baird.....i 41
High-temperature feed-water heating, Peck-Wheeler system.....v 196
High temperatures obtained by a new method, xi 772; by burning aluminum.....xvi 319
High temperatures, tensile tests at.....x 516
Hildebrand, Ger., launch, iv 847; coal-consumption and boiler data, xiv 116
Hill, Warren E.—Welded-steel steam pipes.....vi 731
Hindustan, Br., launch.....xvi 339
Hine, Robert B., Chief Engr., U. S. N.—Contractor's full-power forced-draft trial of the U. S. S. *Concord*, iii 89; obituary.....vii 635
Hints on the inspection of steel.—Moritz.....xv 609
Hirondelle, Fr., early Belleville boilers.....xvi 410
His Imperial German Majesty's cruiser *Vinete*.—Inch.....xiv 212
Hist, auxiliary navy, x 536; data, x 824; steaming radius.....xiii 58
Hiyei, Jap., mention in battle of Yalu.....viii 372
Hoche, Fr., des. and trials, iii 269, 602; alterations, vii 428; tests, xi 96; boiler trials, xii 839; trials.....xii 1105

Hodgkinson, Francis.—Steam turbines, with special reference to the Westinghouse-Parsons steam turbine.....xiii 112
Hoffman, W. D.—Liquid fuel.....xv 231
Hogue, Br., launch and des., xii 837; trials, xiv 206, 312; machinery space, xiii 867; note.....xiii 1101
Hohenstein boiler: compared with other straight-tube types, xv 228; des., xv 213; extract from 1892 report of Engineer-in-Chief, xiv 1228; performance data, xvi 153, 163; report of board.....xvi 719
Hohenzollern, Ger., des., vii 431; coal-consumption and boiler data...xiv 116
Hoists, ammunition, pneumatic, *Terror*.....ix 20
Hoisting machines for mines.....xi 1074
Holden system, liquid fuel.....vii 750
Holland, purchase, xii 556; trials.....xiii 243
Holland, Ger., launch.....ix 182
Holland, Hol., des., vii 829; Yarrow boilers.....viii 406, x 887
Holland, *Elizabeth*, see *Coaler* and *Leonidas*.
Holland, navy, water-tube boilers, xii 748; shipbuilding, program, 1897, ix 130
Holland submarines, gasoline engines for.....xiii 144
Hollis, Prof. Ira N., formerly P. A. Engr. U. S. N.—Steel castings, i 193; Marshall valve gear, ii 1; the chase of the *Itata*, iv 361; the marine engine (lecture before Naval War College), iv 712; coal endurance and machinery of the new cruisers (lectures before Naval War College), iv 637; boilers and their deterioration (lecture before Naval War College), iv 684; miscellaneous items, coal, etc. (lecture before Naval War College), iv 740; economical speed and coal endurance of war vessels, as affected by the relation of the coal expended for propulsion to that expended for all other purposes, v 66; discussion, v 114; discussion, air pumps, vi 541; tests of the boilers of the steam yacht *Wild Duck*, vii 79; discussion, experimental station and engineer school, vii 481; engineering in the navy.....xv 808
Hollow and solid shafting, relations.....vii 507
Hollow forgings.....xiv 1219
Hollow steel forgings.—Porter.....ix 84
Hollow steel forgings, fluid-compressed and bored methods compared, x 1016
Hollow shafting, advantages of.....vii 507
Hollow steel shafting.....ix 84
Holmes, U. T., Lt., U. S. N.—Carbonic-anhydride ice machines of captured Spanish gunboats, xiv 525; *Tacoma*, general description, official trial.....xvi 1
Homestead Works, limits of sizes of steel plates.....i 135
Hong Kong Maru, mer. str., data.....x 919
Hood, Br., trials, vi 182; qualities and performance.....vi 464
Hopetown, The Right Hon., Earl of.—Discussion, logical arrangement of motive power of war ships.....xi 680
Hopkins, destroyer *No. 6*, named, x 818; full data, xiii 1082; launch, xiv 616; des. and contract trials, xv 694; temperature and launching strains.....xv 712

Hopkins, Sir John.—Discussion, design of a fast scout, xiii 416; discussion, conversions and re-armament of ships, xiii 629; on rotation of propellers.....xvi 120
Horatio Hall, mer. str., des.....x 598
Hornet, data, x 534; steaming radius.....xiii 60
Hornet, Br., des. and trials, v 655, vi 424; trials, vii 426, 733, xi 328; speed and power, vii 426; Yarrow boilers, vi 391; test of boilers, vi 163; steel to replace copper tubes.....vii 426
Horsepower data: *Alabama*, xii 881; *Albany*, xii 311; *Albatross*, vi 510; *Annapolis*, ix 568; auxiliary machinery—*Charleston*, *Philadelphia*, *San Francisco*, *Newark*, *Yorktown*, *Concord*, *Bennington*.....iii 217
Baltimore, i 344, ii 123, iii 582; *Bancroft*, v 383; *Bennington*, iii 214; *Bergen*, ii 277, 280, 286, 289; *Boston*, iii 582; *Brooklyn*.....viii 763
Castine, v 867; *Charleston* (old), i 326, iii 582; *Chicago*, iii 582; *Cleveland*, xv 1134; *Concord*, iii 96, 582; *Colorado*, xvi 1137; *Columbia*, vi 43; *Cushing*.....iv 54
Denver, xvi 87; second trial, xvi 618; *Des Moines*, xvi 236b; *Dolphin*.....iii 582, vi 741
Ericsson engine with Belleville boiler.....ii 475
Florida.....xv 573
Helena, ix 372; *Hudson*.....v 709
Gibraltar, Br., v 737; *Gresham*.....ix 265
Indiana, vii 665; *Illinois*, xiii 584; *Iona*, mer. str., iii 390; *Iowa*.....ix 480
Katahdin, viii 17; *Kearsarge*, xi 850; *Kentucky*.....xii 24
Machias, v 867; *Maine* (old), vii 31; *Maine*, xiv 1140; *Manning*, ix 723; *Marblehead*, vi 145; *Marietta*, ix 654; *Massachusetts*, viii 268; *McCulloch*, ix 723; *Meteor*, i 232; *Minneapolis*, vi 728; *Missouri*, xv 1209; *Monterey*.....v 137
Nashville, ix 590; *Nevada*, xv 108; *Newark*, iii 116, 582; *Newport*, ix 559; *New York*.....v 632
Ohio, xvi 1058; *Olympia*, vi 257; *Oregon*.....viii 475
Petrel, iii 582; *Philadelphia*, ii 413, 535, iii 582; pumping engine tests, Washington, D. C.....i 57
Raleigh.....viii 301
San Francisco.....ii 552, iii 582
Tacoma, xvi 27; *Texas*, viii 93; typical ocean steamers (forty).....vi 162
Vesuvius, ii 417, iii 582; *Vicksburg*, ix 559; *Victory*, mer. str., vii 777; *Ville de Douvres*, mer. str.....iv 422, 427, 577
Wheeling, ix 654; *Wilmington*, ix 372; *Winifred*, mer. str., x 995; *Wisconsin*, xii 997; Worthington pumping engines, ii 64; *Wyoming*..xv 100
Yorktown, i 146; iii 582; *Yosemite*, yacht.....vii 692
Zenith City, mer. str.....vii 774
Horsepower for marine propulsion, calculation of.....viii 310
Horsepower, increase of, at a given speed, due to foul condition of a ship's bottom.—McFarland.....i 73
Hortense, auxiliary navy, x 536; data.....x 824
Hot-air and induced draft, combined in boilers fitted with "Serve" tubes and retarders.....v 828

Hot-air house heating, sizes of pipes for.....xii 503
Hot-bath tempering.....xiv 273
Hotspur, Br., des.....i 266
Hot treatment of boiler tubes.....xv 422
Hot-water heating from a central station.—Yaryan.....xii 421
Hot-water vs. steam for heating.....xii 430
Housings, engine, plate steel, for cruiser *No. 11* (*Marblehead*).....iv 90
How to accurately measure the speeds of large, fast vessels during several consecutive hours.—Isherwood.....ii 93
Howden, James.—Transmission of heat through tube plates, v 462; on the comparative merits of clyindrical and water-tube boilers for ocean steamships, vi 373; discussion.....vi 394
Howden system of forced draft, viii 141, x 206; on *Carinthia* and *Sylvania*, vii 843; *Chicora*, iv 865; *Harvey H. Brown*, vi 816; *Piet Hein*, viii 194; *Pomona*.....vii 436
Howell, Charles P., Commander, U. S. N.—Obituary.....xii 274
Howell's Steam Vessels and Marine Engines, book received.....viii 217
Howe, Br., des. i 164; endurance trial, iii 133; speed and power, vi 491; coal consumption.....xiii 1029, 1031, 1032
Howe, Chas. M.—The Niclausse boiler.....xv 1163
Hoxie, W. D.—Discussion, water-tube boilers a necessity.....xi 33
Hudson, trials, v 703; data.....x 534
Hughes.—Discusssion, Yarrow's feed-water heater.....x 420
Hull, destroyer *No. 7*, named, x 818; full data, xiii 1082; launch, xiv 947; des. and contract trials, xv 694; temperature and launching strains, xv 712
Hull data.
Alabama, xii 863; *Albany*, xii 282; *Albatross*, vi 498; *Annapolis*, ix 560; *Arkansas*.....xiv 1173
Bainbridge, xiv 1006; *Baltimore*, i 337; *Bancroft*, v 366; *Barry*, xiv 1006; *Bennington*, see *Concord; Bergen*, ii 256; *Brooklyn*.....viii 743
Campania, mer. str., v 385; *Castine*, v 848; *Charleston* (old), i 310; *Chauncey*, xiv 1006; *Cleveland*, xv 1110; *Concord*, iii 89; *Condor*, It., xii 77; *Columbia*, vi 14; *Cushing*.....iv 8
Decatur, xiv 58; *De Long*.....xiv 826
Florida, xv 547; *Foote*.....ix 656
Helena, ix 362; *Hopkins*, xv 697; *Hudson*, v 703; *Hull*.....xv 697
Gibraltar, Br., v 733; *Gresham*, ix 255; *Gwin*.....x 493
Indiana, vii 640; *Illinois*, xiii 560; *Iona*, mer. str., iii 374; *Iowa*, ix 457; *Iroquois*, iii 146; *Iroquois*, mer. str.....vi 446
John W. Gates, mer. str.....xii 898
Kearsarge, xi 824; *Kentucky*, xii 2; *Korea*, mer. str.....xiv 381
Lawrence.....xv 669
Macdonough, xv 669; *Machias*, v 848; *Maine* (old), vii 3; *Maine*, xiv 1123; *Manning*, ix 711; *Marblehead*, vi 130; *Marietta*, ix 642; *Massachusetts*, viii 241; *Mayflower*, mer. str., iv 849; *McCulloch*, ix 713; *Minneapolis*, vi 717; *Missouri*, xv 1186; *Monterey*, v 119; *Morris*.....x 502

Hull data.
Nashville, ix 577; *Newark*, iii 100; *Newport*, ix 550; *New York*.....v 616
Olympia, vi 244; *Oregon*.....viii 444
Paul Jones, xiv 774; *Philadelphia*, ii 524; *Perry*, xiv 774; *Pennsylvania*, mer. str., xi 558; *Pilgrim*, mer. str., iv 849; *Plymouth*, mer. str., iv 849; *Preble*, xiv 774; *Puritan*, mer. str.....iv 849
San Francisco, ii 537; *Shubrick*, xiii 587; *Stewart*.....xv 112
Talbot, x 493; *Terror*, ix 14; *Texas*, viii 86; *Thornton*, xiii 587; *Truxtun*, xiv 1086, xv 393; Turkish torpedo boats, ii 113; typical ocean steamers (forty).....vi 162
Variag, Rus., xii 1010; various ships used in speed curves, iii 557; *Vicksburg*, ix 550; *Victory*, mer. str., vii 765; *Ville de Douvres*, mer. str.....iv 410, 543
Wacouta, yacht, xiv 1151; *Wheeling*, ix 642; *Whipple*, xiv 1086, xv 393; *Wild Duck*, yacht, vii 79; *Wilkes*, xiv 857; *Wilmington*, ix 362; *Winifred*, mer. str., x 983; *Wisconsin*, xii 979; *Worden*, xiv 1086, xv 393; *Wyoming*.....xv 84
Yorktown, i 137; *Yosemite*, yacht.....vii 669
Zenith City, mer. str.....vii 765
Hunt, A. M., Asst. Engr., U. S. N.—Notes on inspection and manufacture of steel plates, i 128; discussion, boiler tube, inspection and manufacture, ii 306; steel crank-shaft forgings.....iii 1
Hunter, Br., launch, viii 180; machinery.....viii 393
Huntress, data.....x 824
Huntress (2d), data.....x 824
Huntress, yacht, launch and des.....vii 630
Hussar, Br., des.....iv 833
Hval, Nor., dimensions.....ix 432
Hyacinth, Br., launch and des., ix 165, x 1190; battery, ix 415; trials, xii 246, xiii 280, 698, 1004; boilers, xvi 919; speed, xii 248; Delaunay-Belleville, comment on report of trials, xiv 905; compared to *Jurien de la Gravière*, Fr., xiv 325; data compared with *Minerva*, Br., and *Saxonia*, mer. str.....xiv 460
Hyacinth and *Minerva*, Br., trials, 2d report, xiv 458, 473–4; trials,...xiv 638
Hyacinth-Minerva, boiler discussion.....xvi 515
Hydra, Br., des.....i 266
Hydraulic plant: *Massachusetts*, viii 261; *Oregon*, viii 468; *Texas*, viii 85; *Empress of India*, pipes fitted to prevent freezing of, viii 163; pumps, *Maine* (old).....vii 22
Hydraulic press, xi 502; vs. steam hammer.....v 715
Hydraulic pressure for ship central power plants.....x 95
Hydraulic transmission of power for auxiliaries on board ship, iv 173; in factories and mills.....xii 403
Hydraulic vs. pneumatic systems, *Amphitrite* and *Terror* compared...ix 542
Hydraulics of the resistance of ships.....xiv 555
Hydrogen, liquefaction of.....x 775

I

I, Ger., data.....xiv 357
Ice boat *No. 3*, see *Arctic*.
Ice crusher, Rus.....x 917
Ice machines: Allen, dense-air, iv 771; arrangement and service defects, xiv 16; carbonic-anhydride, of captured Spanish gunboats, xiv 525; *Massachusetts*, viii 259; *Oregon*, viii 465; steam-consumption tests, *Minneapolis*.....vi 725, x 53
Ice making, pure water for.....xiii 208
Idaho, 13,000-ton battleship, chief characteristics, xvi 36; bids on, xvi 37; comparison with *Kearsarge* and *Alabama*, xvi 38; contract awarded, xvi 37; weights.....xvi 39
Idaho, mer. str., des.....x 285
Idzumo, Jap., launch and des.....xi 1111
Ignazio Floris, mer. str., des.....viii 209
Ikasuchi, Jap., data, xi 259; des.....xii 256
Illawara, yacht, see *Oneida*, des.....viii 215
Illinois, bids and engines, viii 797; launch, x 1174; preliminary trials, xiii 472; contract trials, xiii 559; docking in floating dry dock, xv 14; station bill, analysis.....xiii 582
Illinois, mer. str. (see *Supply*), des. and diagrams.....iii 470
Illuminating shells.....xi 505
Illustrations.
Accident to torpedo boat, v 484; *Adder*, xv 39; *Adder* and *Moccasin*, propellers, xv 42; air chambers for pumps, x 1120; air pumps, various, vi 524; *Alabama*, xii 855; bunker plans, xii 859; profile, xii 878; *Albany*, xii 279; bunker arrangements, xii 290; main engine, xii 292; profile, xii 312; *Alert*, Babcock & Wilcox boiler, xi 285, 296; Allen ice machine, iv 772, 774; *Amphitrite*, improved ventilation of engine rooms, ix 540; Amsler's polar planimeter, v 665; angle of impact of turbine nozzles, xiii 122; *Annapolis*, main engines, ix 561; *Annapolis* (*Vicksburg* and *Newport*), profile and plans, ix 566; apparatus for ascertaining the efficiency of screw propellers, v 972; for determining transmission of heat, v 437, 441; to determine escape of steam through orifices, xiii 1068; application of oil burner to Scotch boiler, xiv 263; *Argonaut*, xv 1214; water measuring apparatus, xi 365; *Arkansas*, *Florida*, *Nevada*, *Wyoming*, propellers, xv 826; automatic drains and traps, vii 486; automatic stoker, "American," xi 68; automatic stoker, Babcock & Wilcox boilers.....xi 72
Baden, Ger., boilers, Dürr, xiii 887; Bagasse fuel, method of feeding to furnaces, x 142; *Bagley*, profile, plans and section, xiii 652; starboard engine, inboard and outboard sides, xiii 654; forward end, xiii 655; *Bagley*, *Barney* and *Biddle*, xiii 651; *Bainbridge*, xiv 1007; *Bainbridge*, *Barry*, *Chauncey*, type engine, xiv 1011, 1018, balance cylinders, xvi 896, 908; *Bayern*, Ger., boilers, Dürr, xiii 888; bearings, machinery, ix 114, 115, 116; bearings, marine engine, proper position of oil holes, ix 119, 120, 121, 122; *Bennington*, Marshall valve

Illustrations.
gear, iii 216; *Bennington, Concord*, pumps, iii 216; *Biddle*, at full speed, xiii 658; bilge drainage, iv 93, 94, 96, 97; Blake high-duty pumping engine, v 466; Blake vertical, twin, air pump, viii 860; *Bogatyr*, Rus., xiii 791, 792; boiler baffling, xvi 155, 160; boiler and pipe material, test pieces, xi 3; boilers and engines, *William Windom*, U. S. R. C., v 988; boilers, Babcock & Wilcox, viii 772; xvi 133, 1223, 1239; assembling, xi 288; *Nebraska*, xvi 153; Plant Line steamer, vii 702; tested April, 1895, vii 694; test house, xvi 136; boilers, Babcock & Wilcox, Lagrafel-D'Allest, Oriolle, Belleville, Thornycroft, Normand, Du Temple, Yarrow, v 944; Belleville, ii 173; 53 cuts, 12 plates, xvi 383, 525; Blechynden, vi 368; *Charleston* (old), i 328; circulation shown by models, Belleville, Yarrow, Thornycroft, Babcock & Wilcox, Niclausse, experimental, viii 500; compound marine cylindrical, viii 480; corrosion, experiments in raising steam, iii 196; *Crescent*, Br., v 606; D'Allest, vii 448; Dürr, vi 362; experimental, Kiel, xiii 884; furnace fittings, xiii 911; Du Temple, xv 1066; Du Temple-Normand, xv 1068; *Edgar*, Br., v 606; effect on evaporation of inclination and arrangement of tubes, viii 488; Fleming & Ferguson, vi 360; Herreshoff, ii 175; Hohenstein, arranged for burning oil, xv 225; elements, xv 216; sectional view, junction box, 2-inch tubes, xv 220; headers, junction boxes and plugs, xv 218; experimental, xv 213; *Jason*, Br., v 606; Janson water-tube, xiv 1194, 1195, 1196; Lyall, vi 360; Miyabara, water-tube, x 1146; *Monarch*, Br., v 606; Niclausse, vi 368, xvi 1060, 1063, 1064; blow-off connections, xiii 391; complete, xiii 396; drums, xiii 390; element, xiii 387, xv 1163; evaporating tubes, xiii 380; header, xiii 378; lanterns, xiii 382; removing circulating tube and generating tube, xv 1164, 1165; safety water tube, x 110; section and elevation, xiii 388; section through tube, lantern and header, xiii 387; tools, xiii 385, 386; tube, vii 404; tube and lantern, xiii 395; tube caps, xiii 383; Normand, direct and return-flame types, xv 1069, 1071, 1073, 1075, 1077; for yacht *Helena*, xv 1078; Normand-Sigaudy, xv 1079; path of gases in excessive draft, viii 769; Purdue locomotive, xiii 73; *Royal Sovereign*, Br., v 606; Seaton, vi 368; Seabury water-tube, x 774; water drum, x 775; *Sybille*, Br., v 606; Thornycroft, ii 176, xv 1200; *Daring* type, vi 160, xii 25; arrangement of tubes, xii 30; building of, xii 26, 28; *Speedy* type and locomotive compared, vi 352; *Thrush*, Br., v 606; Towne, ii 177; tube bending, xii 33; using waste blast-furnace gas as fuel, x 139; Ward, ii 178; *Monterey*, v 128; water-tube, Weir, x 729; Yarrow's experiments on circulation of water, viii 138; White, vi 368; Yarrow, vi 362, viii 407, 792; arrangement in *Friesland, Holland, Zeeland*, Hol., x 888; bulged steam drum, xi 694; expanding tubes by electricity, xv 845; for Chilian battleships, xv 834; standard types, xv 840; boiler tubes, x 1103; corrosion of, xii 602, 910, xiii 336, 824; die for cold drawing, xv 425; ferrules, v 447; iron and steel, manufacture and inspection, ii 301, 302; nickel-steel, test samples, xi 638; boring bar supports for stern tubes and brackets

Illustrations.
of U. S. S. *Raleigh*, v 340; boring stern tubes, *Olympia*, v 10; bow waves, xi 592, 632; *Brooklyn*, viii 741; profile, plans and sections, viii 744; fireroom and engine room.....ix 400, 401
Calculations of power for marine propulsion, viii 318; calorimeters, vii 301, 302, 304, 305, 307, 308; throttling, testing apparatus, viii 103, 106, 109; *Campania* and *Great Eastern*, profile and section, v 808; *Camperdown*, Br., damages to, vi 108; cast-steel and plate engine frames, *Cruisers Nos. 9, 10, 11*, iv 90; cast-steel steam pipe, defective, xi 699; centrifugal fans, ix 294, 298, 303, 306, 314; centrifugal pump, iii 339, 342, 343; centrifugal power pump, De Laval, xvi 552; characteristics of submarine boats, xiii 475; Charlottenburg laboratory, xv 1040; *Chateaurenault*, Fr., x 879; *Chevalier*, Fr., propeller arrangement, vi 588; *Christopher Columbus*, mer. str., v 244, 245; *Cincinnati*, air heater for boilers, xii 884; boiler, Babcock & Wilcox, xii 882, xv 78; engines, xi 214; *Cristobal Colon*, Sp., profile, machinery space, x 586: *City of Everett*, mer. str., oil-fuel installation, xv 244; *City of Paris*, mer. str., L.P. cylinder and propeller strut bearing, vi 312; Clark automatic coaling and weighing barge, xiii 29; *Cleveland*, xv 1110; arrangement of machinery, xv 1116; Babcock & Wilcox boilers, *Alert* type, xv 1122; bunker arrangement, xv 1122, coaling at sea, Cunningham-Seaton proposed method, xv 1059, 1060, 1061, 1062; coaling of warships, xiii 1; Coffin averaging instrument, v 679; collapse of furnace, ix 395; *Colorado*, xvi 1118; machinery arrangement, xvi 1120; *Columbia*, triple-screw protected cruiser, vi 1; plans, elevations and sections, vi 14; engines, vi 16; propeller arrangement, vi 22; *Concord*, repairs to valve chest, vi 764; steam-piping arrangement, iii 406; *Condor*, It., profile, plans and sections, xii 78; copper exhaust pipe, collapse of, xi 697; copper pipes, defects in, xi 696, xii 134; methods of winding, vii 512; corrosion of boiler tubes, xiv 524, xvi 534; construction of a typical "C" motor, xiii 998; crank-shaft fittings, iii 329, 331, 334; crane, electric-traveling, built by Yale & Towne Mfg. Co., for World's Fair, Chicago, Machinery Hall, v 921; cranes, shipbuilding works, xiii 969; *Cruiser B*, Ger., boilers, Dürr, xiii 897; *Cushing*, engines, ii 220; cylinder arrangements.....xiii 851
Davidson pump-valve gear, ix 387; *Decatur*, xiv 1; engine, xiv 57; air pump, xiv 63; propellers, xiv 64; defective bearing metal, xii 130; defective castings, i 206; defective forgings, xii 134; DeLaval nozzle, xiii 118; *D'Entrecasteaux*, Fr., x 885; *Denver*, xvi 1; engines, xvi 72; destroyer circulating pump, xii 104; destroyers *Dale* and *Decatur* in drydock, xiv 58; *Diadem*, Br., Belleville boilers with economizers, x 425; Diesel motor, heat losses, xi 400; distortion and resistance of flat heads, x 660; diving bell, Ryerson's, xiv 851; *Dupetit-Thouars, Gueydon, Montcalm*, Fr., x 871; dynamos.....ii 310, 332
Eastern States, mer. str., xv 464; Edison's storage battery, xiii 458, 1076, 1077; details, xiii 670; plates, xiii 671; electric-lighting plant, Government Hospital for the Insane, Washington, D. C., ix 239, 241,

Illustrations.
252; electric traveling cranes, v 928; electric telegraph signal to engine rooms, iii 204; *El Norte*, mer. str., indicator cards, iv 858; engine framing, British war ships, vii 342; engines for torpedo destroyers, x 1174; high-speed, self-lubricating, marine, ix 696; type Z, 50-foot steam cutter, U. S. Navy, xiv 37; vibrations and balancing, v 978, 982; engineering buildings, University of Michigan, plans, viii 908; University of Pennsylvania, plans, xv 580; evaporator and condenser, viii 96; evaporators, ii 496, 497, vii 491, 492; Baird, i 294, 295, 296; Lillie, multiple-effect, xii 88; Morison special, vii 506; evaporating plant, Lillie, multiple-effect, xii 86; exciter, engine-type, xiii 999; expanding tubes in Yarrow boilers.....viii 589
Feed-water heater, Worthington, marine type, v 342; fitting lignum-vitae on bearings, *Oregon*, xiv 260, 261; floating derrick at Cramp's, v 478; floating drydock, Cavite, elevation, plan and sections, xv 487, 488, 490, 495, 496, 501, 503, 504; Havana, plan and elevation, xv 12; New Orleans, xv 1; plan, elevation and sections, xv 8; self-docking, middle pontoon, xv 15; Stettin, x 679; *Florida*, xv 546, 577; bow view, xv 548; coal bunkers, xv 550; machinery plan, xv 557; Mosher boiler, xv 563; *Foote*, Mosher boilers, ix 663; forced-draft system *Pinta's* launch, i 336; form of wheel grooves for rope drives, xi 135; *Forte*, Br., machinery arrangement, vii 342; Foster automatic safety stop valve, viii 592; four-cylinder marine engine, data of unbalanced moving weights, xiv 122; fracture of open-hearth steel ingot, vii 413; furnaces, Brown's corrugated, test of, xv 188, 189, 190, 191; longitudinal elasticity, v 36; collapse of, vii 131; furnace forms, Adamson, Fox, v 20; Farnley, Holmes, Purves.....v 24
Gauge for testing circularity of boiler furnaces, x 1077; *Garibaldi*, It., xiii 506; glass revealer for studying condensation, xii 999; *Goldsborough*, flaws and breaks in crank shafts, xv 790; location of test pieces, broken crank shaft, xv 792; damages to machinery, xv 794, 795, 796; relation of engine foundations to floor members, xv 798; governor, steam turbine, Westinghouse-Parsons, xiii 129, 131; *Grampus*, xv 584; Great Lakes district, map, xv 461; great northern elevator and shipping, Buffalo, N. Y., xv 470; *Gresham*, U. S. R. C., ix 254; launch, 254; engines.....256
Harvard, mer. str., launch of, xv 458; heaters, distilling plant, Dry Tortugas, xii 93; *Helena*, broken propeller shaft, xi 901; *Helena* and *Wilmington*, air pumps, ix 372; cross section, ix 361-4; engines, ix 364; propellers, ix 365; *Heron*, Br., x 557; *Hiawatha*, yacht, engines, ix 209; hollow steel forgings, Ferris wheel shaft, ix 93; field ring for 5,000-H.P. dynamo, ix 99; fluid-compression plant, ix 84; forging and tempering, ix 91; shaft under hydraulic press, ix 89; shafting, ix 90; shafting for *St. Louis* and *St. Paul*, ix 100; solid and bored ingots, ix 86-7; *Hopkins*, xv 609; *Hopkins* and *Hull*, propellers, xv 701; stations for observation of strains, xv 714; hot-water heating, insulation, xii 425; hydraulic flanging machine.....ii 140

Illustrations.

Ikasuchi, Jap., xi 260; *Illinois*, xiii 584; docking in floating dry dock, xv 14; *Inchdune* and *Inchmarlo*, mer. strs., boilers, xiii 152; superheaters, xiii 153, 155; *Indiana*, vii 638; engines, vii 643; profiles, plans and sections, vii 666; indicator diagrams, multiple-expansion engines, xi 50; indicator test outfit, iii 326; induced draft and hot air in boilers with "Serve" tubes and retarders, v 828; *Injeniero Hyatt*, Chile, ix 797; *Iowa*, ix 453; feed-water heater, ix 465; profile, plans and sections.....ix 480

Jeanne d'Arc, Fr., x 864; jib crane, 150-ton, electric.....ix 176

Kaiser Friedrich III, Ger., injuries in grounding, xiii 635–6–8; *Kaiser Friedrich III*, mer. str., Krupp crank shaft, x 1021; *Katahdin*, viii 4, 16; main engines, viii 8; propellers, viii 18, 20; profile, plans and sections, viii 20; *Kearsarge*, xi 823; main engines, xi 830; auxiliary steam and exhaust pipes, xi 836; boilers, xi 838; in dock, xi 846; profile and plans, xi 850; *Kentucky*, xii 1; bunker plan, xii 5; main engines, xii 8; boiler arrangement, xii 10; auxiliary steam and exhaust pipes, xii 15; *Korea*, mer. str., xiv 380; main engine.....xiv 390

Lawrence, xv 667; LeChatelier pyrometer, x 1010; lignum vitae linings, xiv 529; liquid-fuel burners, xv 246, 248; locomotive, arranged for oil fuel, xv 236, 238, 240; burning oil and coal, xv 231; locomotive crane, 10-ton, steam, by Yale & Towne Manufacturing Co., vi 147, 154

Machine shop, New York Navy Yard, xi 185, xiii 872, 876; indicator testing apparatus, xiii 878; machinery bearings, testing machine, ix 104-5; *Maine*, x 1164, xiv 1003; *Maine* (old), vii 2; main engines, vii 8; air pumps, vii 12; boilers, vii 16; turret engines, vii 24; *Manchuria*, mer. str., assistant cylinders, xvi 719; *Manning*, U. S. R. C., ix 711; *Manning* and *McCulloch*, U. S. R. C., main engines, ix 714; *Marblehead*, arrangement of machinery, vi 144; *Marie*, mer. str., xv 460; *Marietta*, Babcock & Wilcox boilers, ix 648, xv 77; header and hand hole, xv 77; Marshall valve gear and diagrams, ii 24; *Massachusetts*, viii 238; main engines, viii 244; profile, plans and sections, viii 269; pumps, hydraulic, pressure, viii 261; coaling from *Marcellus* in tow, xiii 37; *McCulloch*, U. S. R. C., and cross-section, ix 712; propeller hub, xi 446; measurement of feed and circulating water by chemical means, viii 534; of wake currents; v 872; mechanical telegraph, two engine rooms, iii 204; *Medjidia*, Turk., Niclausse boiler, xv 1169; *Mesoudie*, Turk., xiii 1130, 1131, 1132; metal fractures, x 969; metallic packings, rigid and flexible, xv 406, 408, 410, 414; methods of introducing feed water into boilers, v 984; of securing flue gases in boiler testing, x 135; Miller marine cable way, xiii 36, 38; *Minneapolis*, vi 445, 702; air pumps, vi 708; profile, vi 716; main engines, vi 718; machinery arrangement, vi 721; in dry-dock, vi 721; main boilers, vi 722; auxiliary condenser, Wheeler, x 52; plan of main and auxiliary machinery, x 52; *Minnesota*, mer. str., Niclausse boiler, xv 1166; model resistance curves, x 94; mold-

Illustrations.
ing cylinder in dry sand, iv 164; in loam, iv 378, 380, 382, 384; Morison's suspension furnace.....v 14
Nashville, sections, ix 574–6; circulating pump, engine and auxiliary air pump, ix 581; profile and plans, ix 588; feed regulator, ix 792, 793; *Nevada*, Niclausse boiler, xv 1173; *Newark*, arrangement of L.P. valve gear, xii 678; new battleship, proposed design, xiii 744, 745; nickel-steel rivets, test plates, x 1038, 1039, 1040; *Niji*, Jap., xii 258; *Nipsic*, propeller, i 356; nozzle flow for steam turbines.....xiii 116
Ocean waves, xi 613; *Ohio*, xvi 1027; Dow air pumps, xvi 1044; oil as fuel, method of weighing and feeding to furnaces, x 136; oil-fuel tests, xvi 720–885; *Olympia*, vi 241; engines, vi 248; *Oneonta*, yacht, x 398; *Onyx*, *Renard*, Br., machinery arrangement, vii 342; *Oregon* in drydock, viii 440; main engines, viii 446; hydraulic plant, viii 468; profile, plan and sections, viii 476; outflow of steam.....xvi 565–587
Parson's steam turbine, v 904; *Parthenia*, yacht, x 395; *Paul Jones*, *Perry*, *Preble*, propellers, xiv 784; alterations of stern, xiv 796; Peck-Wheeler high-pressure feed-water heater, v 197; *Penelope*, yacht, x 400; *Pennsylvania*, mer. str., Minnesota Steamship Co., xi 557; *Perry*, xiv 773; piercing mill for boiler tubes, xv 423; pipe joints, xiii 844; planer for turret roller paths, xiii 966; plate shed, shipbuilding works, arrangement of machine tools, xiii 952, 955; *Plunger* (five), x 366; port areas for steam engines, xvi 588–611; powerhouse, Navy Yard, N. Y., plan and cross section, xiii 982; progress in steamship construction, xiv 571; *Prinz Heinrich*, Ger., boilers, Dürr, xiii 896; propeller-blade inaccuracies, xvi 911, 915; propellers, *Atlanta*, *Boston*, *Baltimore*, *Charleston*, *Chicago*, *Cushing*, *Dolphin*, *Newark*, *Petrel*, *San Francisco*, *Vesuvius*, *Yorktown*, *Concord*, *Bennington*, iv 158; *Denver*, xvi 74; *Des Moines*, xvi 232; harbor-defense monitors, xv 826; screw, arrangement of surface, v 300; screw, various, v 313; Spezia tank experiments, xv 1101, 1103; *Protector*, xv 924, 1216; inboard profile, xv 1218; engines, xv 1224; switchboard, pressure gauges and ballast manifold valves, xv 1226; living quarters, xv 1230; degrees of submergence, xv 1232; cruising rig of conning tower, xv 1238; pyrometer arrangement.....v 447
Queen, hydraulic life-boat, oil-fuel installation, profile, plans and section, x 386; Thornycroft boilers .....x 389
Radial valve gear, Lang, xii 757; *Ramillies*, Br., machinery arrangement, vii 342; Rankine's idealized steam plant, heat losses, xi 398; register for speed trials, iii 88; repair to *Umbria's* shaft, v 186; *Rhein*, Ger., Dürr boilers, xiii 882; rivets, standard dimensions, xi 700; riveted joints, viii 728-39; *Rodgers*, broken crank shaft, ix 687; *Royal Arthur*, Br., machinery arrangement, vii 342; rubber pumps, iv 204
Sachsen, Ger., boilers, Dürr, xiii 893; *Sainte Marie*, car ferry, xv 468; samples of tubes produced by extrusion, xi 42; Scotch boilers, furnace arrangements, x 726; seamless-drawn T's and crosses, xi 14; shaft vibrations, instrument for registering, xiv 725; shallow-draught launch, xiv 1211; ship propulsion, slip of propellers, i 226; ship-

Illustrations.
building works, arrangement of plant, xiii 954; Vicker's, Barrow-in-Furness, England, xiii 949; *Shubrick*, xiii 586; main engine, xiii 590; installing propeller shafting, xii 326; *Shubrick* and *Thornton*, arrangement of air pump, xiii 595; air pump, xiii 593; profile and plan, xiii 590; *Sithonia*, furnace arrangement for liquid fuel, xiv 703, 704; slide-valve relief rings, xiii 850; slip joints, xi 898, 899; smoke chart, Ringelmann's, xii 72; *Sokol*, Russian destroyer, vii 833; *Speedy*, Br., machinery arrangement, vii 342; *Spitfire* and *Swordfish*, Br., engines, ix 689; steam cutter for German Navy, profile, plan and sections, xiii 424; machinery, xiii 425; steam-engineering plant, Navy Yard, New York, xiii 874; steam pipes, steel, welded, vi 734; various forms, v 356; steam temperatures, apparatus for measurement of, viii 119; placing of thermometers, viii 124; steel bed-plate casting, v 41, steel-casting plant, xv 123; steel castings, v 42, 47; runners, gates and risers, xv 133; steel ingots, iii 8; piston, failure of *Charleston*, vii 789; steam pipe for torpedo boat, xi 1; test pieces, iv 436; *Stewart*, xv 111; *St. Paul*, mer. str., rupture of stop valve in main steam pipe, viii 156; stresses of elastic gears, xii 352, 358, 577, 625, 628, 636, 648; structure of rolled metal sheets, x 976; *Stringham*, propellers notched during trials, xv 754; submarine explorer, Kroehl's, xiv 852; submarine torpedo boat, Horsford's, xiv 849; McClintock's, xiv 846; *Sultan*, Egypt, ix 800; switchboard, nine-panel, power plant, Navy Yard, N. Y ....xiii 994
Tacoma, machinery arrangement, xvi 31; target for running shafting lines, v 4; *Tashmoo*, mer. str., xv 466; *Teal*, Br., xiii 778, 779; telescope for running shafting lines, v 3; Temperley conveyor, x 1154, 1155; tensile tests of steel, iv 768; *Terror* and monitors, air compressors, ix 16; *Terror*, pneumatic auxiliaries for guns, turrets and rudder, ix 28; test of Brown's improved corrugated furnace, xv 186; *Texas*, viii 82; turret-turning motor and reversing gear, viii 86; profile, plans and sections, viii 92; coaling at New London coaling station, xiii 24; thermal efficiency of actual and ideal steam plants, xi 954; Thornycroft's screw-turbine propeller, v 479; Thornycroft boiler-feed regulator, x 518; throttle valve, new, steam and hand-operated, xvi 1241; thrust bearing, *Itata*, mer. str., iv 372; *Tingey*, engines, xvi 54; towing steamers for Yukon service, x 740; torpedo-boat destroyers, vii 736; torsional vibrations, zinc diagram, S. S. *Präsident*, xiv 724; experimental gear, xiv 721; triple screws, machinery arrangement, xi 656; trunnion joint to replace slip joint, xi 698; *Truxtun*, *Whipple*, *Worden*, type engine, xiv 1083; profiles, plans, and general arrangement, xv 394; hull section (midship), xv 396; machinery arrangement, xv 396; tube-bending machine, Donaldson's, xii 34; turbine and reciprocating engines, space compared, xiii 866; turbines, steam, balancing, Westinghouse method, xiii 141; *Lorena*, yacht, xvi 1099; Parsons, xvi 1115; *Tarantula*, yacht, xvi 1108; *Turbinia*, mer. str., xvi 1103; Westinghouse, xv 1247; Westinghouse–Parsons, xiii 124, 138, xv 1247; bearings,

Illustrations.
xiii 126; arrangement of blades, xiii 132; *Turbinia*, yacht, profile, plan and sections, ix 572; turbine tube cleaner, xv 71; Turkish torpedo boats.....ii 120
Variag, Rus., xii 1009; Niclausse boilers, xv 1168; Vickers 12-inch gun, x 670; *Vicksburg* and *Newport*, main engines, ix 551; (and *Annapolis*,) section and plan, ix 556; *Victoria*, Br., compartments of, v 700; loss of, vi 47; *Victoria Louise*, Ger., boilers, Dürr, xiii 890; *Vigilant*, yacht, v 998; *Vineta*, Ger., boilers, Dürr, xiii 894; gear for handling coupling bolts, 215; *Viper*, Aus.....viii 806
Walking-beam, counter balance, xiv 528; Walsh coal and freight-delivery vessel, xiii 33; watertight doors, viii 334; Webster's clinometer, iii 348; welded steel flange, xi 15; welding furnaces, ii 142; Westinghouse alternating-current engine-type generator, xiii 1000; Westinghouse multipolor exciter, xiii 986; whaleback steamers, iv 456; *Wheeling* and *Marietta*, profile, plans and sections, ix 654; main engines, ix 643; whistle valve, automatic, balanced, xi 201; White turnabout launch, ii 222; *Wisconsin*, xii 979; bunker plans, xii 983; profile, xii 986; main engine, xii 989; *Woodlark*, Br., x 785; *Worden*, xv 393; starboard engine, xv 396, 397; port engine design, xv 398, 400; *Wyoming*, xv 83; Babcock & Wilcox boilers.....xv 78
Yarrow's feed-water heater, x 410; Yarrow-Schlick-Tweedy system of balancing engines, x 482; *Yosemite*, mer. str.....xv 462
Zenith City, mer. str., Lang radial valve gear.....xii 759
Illustrious, Br., dimensions, vi 423; floated, viii 810; coal consumption, x 228; trials.....x 550, xi 243, 320
Iltis, Ger., rod pressure, xiv 21; cylinder data, xiv 37; coal consumption and boiler data, Thornycroft.....xiv 117
Immortalite, Br., des.....i 264
Imperator (see *Emperor*) *Alexander III*, Rus., trials.....xvi 367
Imperator (see *Emperor*) *Nicolai I*, Rus., machinery.....xiii 512
Imperial Japanese Navy.....xii 434
Impetueuse, des.....vii 173
Implacable, Br., launch and data, x 861, xi 521; trials.....xiii 488, xiv 206
Improvement in installation and fitting of naval machinery.—Dinger..xvi 98
Improvement in open-hearth steel making.....xi 449
Improvements in shallow-river navigation.....xiv 1029
Improvement in the big shipyards.....x 1115
Impulse multiple-action steam turbines.....xvi 203
Impulse, single-action, steam turbines.....xvi 200
Inadsuma, Jap., des.....xii 256
Inboard-turning propellers, *Cleveland*.....xv 1136
Inboard- or outboard-turning propellers, effect of.....x 485
Inca, data.....x 824
Inch, Richard, Captain, U. S. N.—His imperial German Majesty's cruiser *Vineta*.....xiv 212
Inchdune, mer. str., engines and boilers.....xiii 151
Inchkeith, mer. str., des.....xi 807

Inchmarlo, mer. str., engines and boilers.....xiii 151
Inchmona, mer. str., dimensions, viii 422; trials.....viii 652
Incidental uses of series field windings of compound dynamos..... .xii 178
Inconstant, Br., des.....i 266
Increase of horsepower for a given speed, due to foul condition of ship's bottom.—McFarland.....i 73
Increase of the strength of steel after manufacture.....xi 199
Indefatigable, Br., launch and des., iii 265; trials.....iv 120
Independence, yacht, des., xiii 551; races.....xiii 809
Independencia, Arg. Rep., des.....v 229
Independencia, San Domingo, launch.....vi 809
Independent air pumps, boiler committee recommends.....xiv 873
India, mer. str., dimensions, viii 421; des.....ix 201
India as a center for steel manufacture.....xi 1005
Indiana, work on, iv 292; authorization and des., ii 409; changes and bids on, ii 575; launch and des., v 492; trial, vi 421; des. and contract trial, vii 637; engines and steam cylinders, vii 662; coal economy on blockade duty, x 1044; steaming radius, xiii 60; coal consumption, xv 366, 379
Indiana, mer. str., weight and particulars of boilers.....vi 395
Indicated horsepower and heating surface, ratio of, used in British navy, vii 784
Indicator cards, combined, of *Yorktown*, i 268; value discussed as a record of performance.....ix 1
Indicator diagram: effect of long pipe connections, ix 392; of multiple-expansion engines.—Ball.....xi 46
Indicator tests.—Conant.....iii 322
Indicators: defects in, iii 436; electrically connected, iii 161; testing apparatus, steam-engineering plant, Navy Yard, N. Y., iii 322, xiii 879; Thompson, Tabor and Crosby, compared at 800 revolutions. .....v 1025
Indomptable, Fr., reconstruction .....xiv 325
Indrani, mer. str., dimensions, machinery weights, data, xiii 862; machinery space .....xiii 867
Induced draft: vii 786; and hot air combined, in boilers fitted with "Serve" tubes and retarders, v 828; Ellis & Eaves, xiii 154; in connection with superheaters, viii 362; Martin's system, ii 567; on *Magnificent*, Br., trial of.....vii 812
Indus, Br., training of engine-room artificers.....xvi 646
Indus, mer. str., launch.....ix 835
Inertia stress of elastic gears.—Macalpine, xii 329, 603, 913; of a slide valve.....vi 272
Infanta Maria Teresa, Sp., des., i 360; launch and des., iii 138; des. and trials.....v 960, vi 621, 630
Infante Dom Henrique, Port., note.....ix 822
Infernet, Fr., des., viii 190; launch.....xi 1107
Inflexible, Br., des.....i 164
Influence of bilge keels on the rolling and the resistance of torpedo-boat destroyers.....xiii 455
Influence of bismuth on brass and its relation to fire cracks.—Sperry...x 1069
Influence of casting temperature upon steel.....xi 730

Influence of compression in cylinder clearance spaces upon steam consumption per I.H.P.....xii 315
Influence of copper on steel rails and plates.—Stead-Evans.....xiii 678
Influence of inward- and outward-rotating propellers on the maneuvering quality of vessels.—Roelker, translation.....xvi 119
Influence of shock on propeller efficiency.—Durand.....iv 611
Ingenieurs Taschenbuch, book received.....xiv 1284
Ingots, compound, Cosgrave process of making, xiii 463; copper, xvi 979; making, iron and steel.....xiv 276
Injector burners, oil.....xvi 847
Ingeniero Hyatt, Chili, speed, ix 406; data.....ix 797
Insolente, des.....viii 173
Inspection and manufacture of boiler tubes.....ii.. 301
Inspection and manufacture of steel plates, notes on.—Hunt.....i 128
Inspectors of machinery afloat, British Navy.....iv 113
Inspection of steel, hints on.....xv 609
Inspection service, U. S. steamboat, revision of boiler laws.....xv 382
Inspection, steamboat, proposed revision of rules.....iv 210
Installation of naval machinery.....xvi 98
Instance of great economy by superheating.....x 205
Institute of Marine Engineers, extract from address of President Durston.....vii 779
Institute of Naval Architects of Great Britain, program.....xvi 641
Instructions for determining the coal consumption on vessels of the French Navy.....ii 406
Interchangeability of units in machinery.—Forbes.....xii 104
Interim report of the boiler committee appointed by the British Admiralty.....xiii 353
International Engineering Congress, v 532, 637; list of authors.....v 535
International Line's great ships.....v 236
International Navigation Company, new ship.....v 522
International standard of metric screw threads.....xi 206
International yacht races, 1893.....v 650
In-turning screws, *Formidable*, Br.....xiii 1082
In-turning vs. out-turning screws.....xv 433
Inventions, unserviceable.....xi 979
Investigations of a blowing fan.....xi 186
Investigation of distortion and resistance of flat heads.—Bach.....x 660
Investigation of the mode of action of ship-formed solids on the water in which they move and of the mode of action of this water upon them, determining the causes of the squatting of vessels and of their increased resistances as the water shoals below a certain depth.—Isherwood.....iv 329
Investigation of "Notes on Analysis of Engine Trials."—Isherwood.....iii 33
Investigation of the stresses on frames of vertical, inverted steam engines.—Schwarz.....xv 19
Investigation of the stresses on frames of vertical steam engines, as modified for marine engines.—Meyer.....xv 971
Invincible, Br., des.....i 265

Inward- and outward-rotating propellers, influence on maneuvering quality of vessels.....xvi 119
Iolaire, yacht, launch and des.....viii 213
Iona, mer. str., marine engine trials, iii 374, iv 426; comparison of machinery and performance with *Baltimore*.....vi 685, vii 53
Iowa, des., iv 811; bids, v 202; launch, viii 383; des., contract trials, ix 453; trials, ix 400, x 220; steaming radius, xiii 60; rapid coaling of, xii 222; list of engines and steam cylinders, ix 478; coal consumption, xv 366, 379
Iphegenia, Br., failure on trial, ferruled boiler tubes.....iv 837
Iris, auxiliary navy, x 537; data, x 824; test of evaporating plant, xi 889; steaming radius.....xiii 60
Iris, Br., des., i 264; trials, ii 234; experiments on screw propellers...xvi 308
Iris, mer. str., trials.....vi 590
Iron alloys.....iii 500
Iron and steel: boiler tubes, manufacture and inspection, ii 301; effect of temperature on, ii 144; exports, xii 500; ingot making, xiv 276; process of purification from sulphur, iv 757; slow combustion, i 364; steam pipes, remarks on, vii 522; structures, permanence of, xiii 210; Swedish, strength tests.....x 1149
Iron: boom in, xi 756; cast, crystallization and segregation, xi 1001; cast, the melting point of, x 1009; cements, "Smooth-on," xiii 207; China, xii 1085; -copper-zinc alloys, iii 493; corrosion of, xii 1064; elimination of sulphur, iv 757; frame work, painting, v 713; industry, American, outlook in, xi 1019; mixtures, x 1060; -nickel alloy, for incandescent electric lamps, xi 227; ore mine, greatest in the world, xiii 181; ore, total production, xiii 177; ore, world's production, xiii 177; ores, Lake Superior, analyses, v 148; passive state of, xii 1084; production in U. S., xi 739; protection from rust, xi 448; specifications, x 1060; vs. steel boiler tubes, iv 488; vs. steel tubes, v 1030; wrought, extinction of, xi 204; zinc as a protective coating for.....xii 789
Iron Duke, Br., des.....i 264
Iroquois, test of Klotz's forced draft system in launch of.....i 334
Iroquois, auxiliary navy, x 537; data.....x 824
Iroquois, mer. str., des., iii 146; experimental test of steam plant and review of.....vi 445
Irresistible, Br., dynamos and engines, xi 507; trials, xiv 206; repairs, xiv 314
Is the patent log maligned?—McKean.....ii 227
Isabel la Catolica, Sp., note.....ix 824
Isherwood, B. F., Chief Engineer, U. S. N.—Progressive trials of steam barge of commandant of New York Navy Yard, i 1; an exposition of the mode in which water is affected by a body moving in it, i 97; test of Corliss boilers, etc., etc., i 299; test of Worthington pumping engines, New Bedford, Mass., ii 26; how to accurately measure the speeds of large, fast vessels during several consecutive hours, ii 93; discussion: tubulous boilers, pipe boilers versus shell boilers for naval service, ii 180; account of experiments on double-screw ferry boat *Bergen*, etc., etc., ii 251; Ericsson compound engine and Belleville boiler, ii 445; experiment on the Belleville boiler in the steam yacht *Shear-*

water, ii 484; an investigation of Asst. Engr. W. H. Allderdice's "Notes on Analysis of Engine Trials," iii 33; an analysis of the results of experiments made with the Orvis system of increasing the economic vaporization of steam boilers and of preventing smoke in their furnaces, iii 295; the United States torpedo boat *Cushing* and its experiments investigated, iv 1; an investigation of the mode of action of ship-formed solids on the water in which they move, and of the mode of action of this water upon them, determining the causes of the squatting of vessels and of their increased resistances as the water shoals below a certain depth, iv 329; an analysis of the results of the experiments made on the paddle-wheel steamer *Ville de Douvres*, etc., etc., iv 539; discussion, effect of auxiliaries on economical speed and coal endurance, v 83; experimental comparison of a single-cylinder engine with a triple-expansion engine, v 271; digest of Professor Cecil H. Peabody's experiment with the George F. Blake Mfg. Co.'s pumping engine, etc., Newton, Mass., v 769; *Albatross*, vi 497; digest of the experiments made by Mr. Michael Longridge * * * on triple-expansion pumping engines, East London Water Works, Lea Bridge, etc., vii 215; discussion, experimental station and engineer school, vii 454; the steam yacht *Yosemite*, vii 668; dedication of bronze bust of, x 440; compression of back-pressure steam into the waste space of cylinders.....xii 770

Isis, Br., launch, viii 618; des., ix 414; trials..... xi 324

Isla de Cuba, data, xii 553; ice machine.....xiv 525

Isla de Luzon, data, xii 553; ice machine .....xiv 525

Islanda, mer. str., launch.....xi 1121

Isle of Arran, mer. str., des.....v 525

Isly, Fr., characteristics, iii 142; launch, iii 603; boiler trials.....xvi 458

Italia, It., boilers.....xiv 676

Italian Navy, electricity in, xi 457; estimates, xi 1019; Niclausse boiler installations, xv 1172; water-tube boilers.....xii 747

Italy: fast torpedo boats for, built by Schichau, iv 845; naval construction, xvi 362; new cruisers, data, viii 410; new ships, 1898, x 891; shipbuilding, 1901.....xiii 1115

Itata, mer. str., the chase of..... .....iv 361

Itchen, Br., trials.....xvi 259

Itsukushima, Jap., work on, ii 429; trials, iii 145; des., iv 316; mention in battle of Yalu.....viii 370

Ivernia, mer. str., launch and des., xi 1119; data .....xii 577

Ivy, yacht, des .....ix 212

Iwate, Jap., launch and des., xii 575; compared to *Prinz Heinrich*, Ger.....xiv 334

Izumrud, Rus., note, xiv 994; characteristics.....xvi 368

J

Jackdaw, Br., note.....x 227

Jacketed engines, single-cylinder, economic efficiency.....v 277

Jacketed engines, triple-expansion, economic efficiency.....v 288

Jacketing cylinders of a triple-expansion engine, variation in efficiency, iv 486
Jacket, steam for large cylinder barrels, objections.....v 81
Jacobus, Professor D. S.—Measurements of temperatures of steam, viii 115; tests of throttling calorimeters.....vii 140
Jagd, Ger., coal-consumption and boiler data.....xiv 116
Jaguar, Aus., dimensions.....ix 405
Jaguar, Ger., coal-consumption and boiler data, Thornycroft.....xiv 117
Jamestown, mer. str., des.....vi 430
James Watt, mer. str., launch.....viii 865
Jamieson, Prof. Andrew.—On the designing of continuous-current dynamo machines, ii 308; discussion, the marine steam turbine.....xiii 438
Janson, Ernest N.—Merchant steamers for Minnesota S. S. Co., iv 129; review of water-tube boilers now used for marine purposes, with a comparative reference to the ordinary cylindrical type, xiv 409; steam turbines.....xvi 172
Janson water-tube boiler.....xiv 1192
Janus, Br., launch and des., vii 425; des. and trials, viii 835; trials.... xi 328
Japan: as a maritime nation, xiii 219; bridges, xi 1072; coal, xiii 180; docks, xi 773; engineer in war, xvi 1299; imperial navy, xii 434; new battleships, des., xi 258, xvi 363; Niclausse boiler installations, xv 1173; petroleum industry, xii 1084; shipbuilding program, 1897, ix 133; 1898, x 580; 1900, xii 227; 1901, xiii 1120; shipbuilding in Europe, x 267; technical societies, x 1161; war fleet, xvi 314; water-tube boilers, Navy.....xii 747
Jaseur, Br., launch, iv 833; details, v 226; des. and launch.....vi 200
Jason, Br., launch and des., iv 532; des., details and trial, v 226, vi 200; machinery data, viii 568; trials.....xvi 258
Jauréguiberry, Fr., contract for, iii 603; launch and des., iii 279, v 1064, vi 616; preliminary trials, viii 403; trials.....viii 624, ix 421
Jean-Bart, Fr., characteristics, iii 142; defects in, iv 314; Niclausse boilers, xiv 325; boiler trials.....xvi 458
Jeanne d'Arc, Fr., triple-screw, dimensions, viii 188; des., x 864, xi 797, xiv 668; boilers, xii 569; defects, xiii 781, xvi 352; trials, xvi 699; note, xiii 1092
Jed, Br., trials.....xvi 1008, 1326
Jelunga, mer. str., data of quadruple-expansion engines, &c.....i 78
Jemmapes, Fr., des., ii 235; trials.....vi 805, vii 402
Jemtchug, Rus., note.....xiv 994
Jena, Fr., dimensions, ix 424; launch and des., x 1198; commissioned, xii 253; trials, xiii 498, 1092; speed.....xiii 781
Jib crane, electric, 150-ton, Newport News shipyard.....xi 173
Johann Slatust, Rus., characteristics.....xvi 368
John Englis, mer. str., dimensions, viii 430; des.....viii 872
John Ericsson, mer. str., launch.....viii 651
John W. Gates, mer. str., coal consumption tests.....xii 895
Johnson, George R., Chief Engineer, U. S. N., retired.—Obituary.....x 1230
Joint material for pipe flanges.....xiv 9
Joints: pipe, for high pressures, xi 744; riveted, boilers, formulae for, iv 403; riveted, boilers, formulae for strength of, viii 269; riveted,

tests at Watertown Arsenal for Bureau of Steam Engineering, Navy Department, iv 624; riveted, tests of, at Watertown, Arsenal, Mass., viii 727; tests, steel pipes and flanges.....xiii 845
Jones, David Phillips, Chief Engr., U. S. N., retired.—Boiler testing with various fuels, x 129; discussion, speed of construction a vital factor of naval strength, x 160; discussion, the Diesel motor, x 182; obituary.....xv 276
Jones, J. D., data.....x 824
Jordan, S. S.—Space occupied by machinery of some of the new cruisers.....i 249
José Garibaldi, Arg. Rep., description.....viii 605
Joseph Holland, see *Hannibal.*
Josephine, yacht, des., viii 211; launch and machinery.....viii 431
Josephine. See *Vixen.*
Journals, air-lubricated, experiments with.....ix 267
Journals, crank-shaft, dimensions.....ix 78
Joy valve gear, iii 549; No. 1, iii 544; No. 2.....iii 545
Joy.—Discussion, transmission of heat through tube plates, v 462; pipe boilers in the United States.....v 462
Jubilee, yacht, des.....v 998
Jules Ferry, Fr., data.....xii 839
Jules Michelet, Fr., named, xiv 669; data, xiv 668; boilers, Du Temple-Guyot, xvi 352; laying down.....xvi 698
Julio, 9 de, Arg. Rep., trial and des., v 501; performance data.....v 504
Juniata, mer. str., launch.....ix 834
Juno, Br., launch and des., viii 169; characteristics, viii 560; machinery data, viii 568; trials.....xi 324
Juno, mer. str., data, x 929; dimensions, machinery, weights, data.....xiii 862
Jupiter, Br., launch, viii 163; trials, ix 406.....xi 318
Jurien de la Gravière, Fr., note, vii 825, viii 190; launch, xi 801; des., xiv 325; Du Temple-Guyot boilers, xiv 669; trials, xiv 967; defects...xvi 353
Justice, Fr., des.....xvi 353
Justin, auxiliary navy, x 537; data, x 824; steaming radius.....xiii 60

K

K, Ger., second-class cruiser, dimensions, vii 828; triple screws, viii 551; details.....viii 556
K and *L*, Ger., note.....xiv 338
K2, Fr., data.....ix 178
Kabyle, Fr., description.....iv 127
Kaemmerling, Gustav, Lieut., U. S. N.—Contract trial of torpedo boat *No. 28*, the *De Long*.....xiv 825
Kafer, J. C., P. A. Engr., U. S. N., retired.—Discussion, compressed air system of forced draft, i 332; discussion, the Diesel motor.....x 182
Kaiser Barbarossa, Ger., launch and des., xii 569; trials.....xiii 783, xiv 333

Kaiser drydock at Bremerhaven.....xii 222
Kaiser Frederich III (*Ersatz Preussen*), Ger., launch, viii 627; guns, ix 179; trials, xi 255; triple-screw data, xiii 404; grounding, xiii 632; rod pressure, xiv 21; cylinder data, xiv 37; coal-consumption and boiler data, cylindrical, Thornycroft.....xiv 117
Kaiser Frederich, mer. str., note, viii 208, 646, 861; des.....ix 826, x 911
Kaiser, Ger., repair ship, xii 256; data.....xiv 973
Kaiser Karl VI, Aus., trials.....xiii 262
Kaiser Karl der Grosse, Ger., launch and des., xii 255; note, xiv 333; trials.....xiv 675
Kaiser Whilhelm II, Ger., launch, ix 813; coal consumption and boiler data, cylindrical-Schulz.....xiv 117
Kaiser Wilhelm II, mer. str., data, vi 162; launch and des.....xiv 998, 1270
Kaiser Wilhelm der Grosse, Ger., launch, xi 801; des.....xiii 500
Kaiser Wilhelm der Grosse, mer. str., des., viii 860, ix 826, x 271, xiv 1272; pumps, ix 201; record run, 1898, x 608; dimensions, machinery weights, data, xiii 862; machinery space.....xiii 867
Kaiserin Augusta, Ger., des., iv 126; trials, iv 846; des. and trials, viii 627; triple-screw data, iv 289, viii 550, 782, xi 687; rod pressure, xiv 21; cylinder data, xiv 37; coal-consumption and boiler data.....xiv 116
Kaiserin Auguste, mer. str., des.....xvi 1339
Kaiserin Elizabeth, Aus., launch and des.....ii 584
Kaiserin und Königin Maria Theresia, Aus., des. and trials.....vii 153
Kale, Br., launch.....xvi 1326
Kamakura Maru, mer. str., dimensions.....ix 205
Kanagawa Maru, mer. str., dimensions.....ix 205
Kanawha, yacht, dimensions.....viii 433
Kanawha, data.....x 824
Kangaroo, Br., speed, xiii 491; trials.....xiv 208
Kansas, balance cylinders.....xvi 905
Kasagi, Jap., launch and des., x 265; data, x 582; speed.....x 892
Kasatka, Rus., data.....xi 532
Kashima and *Katori*, Jap., new battleships.....xvi 702
Kassarsky, D class, Rus., trial, ii 426; iii 281; comparison with *Geiser* (Den.), in boiler weights, etc.....v 170
Kastalia, mer. str., des.....ix 839
Kasuga (*Rivadavia*), Jap., purchase and des.....xvi 364
Kasuga Maru, mer. str., data.....x 918
Kasumi, Jap., trial.....xiv 343
Katahdin, harbor defense ram, authorization and data, i 236; launch and des., v 202; speed, vii 804; des. and contract trials, viii 1; inertia stresses of valve gears, xii 920; steaming radius.....xiii 60
Kate Jones, see *Seminole*.
Katori and *Kashima*, Jap., new battleships.....xvi 702
Kearney, Geo. H., Comdr., U. S. N.—Breakdown of air-pump gear, *Tallapoosa*, i 248; *Cushing* tests, board of engineers, iv 36; method of molding in loam and casting the cylinders for the cruisers *Cincinnati*

and *Raleigh* at the Navy Yard, New York, iv 376; method of running the lines for the shafting and boring out the stern tubes and brackets for the U. S. S. *Cincinnati*, v 1; discussion, organization of the engineers' division on board a man-of-war.....xiii 944
Kearsarge, des., vii 581, 801; bids, viii 160; launch, x 529; note, xi 781; trial, xii 548; contract trial, xi 823; commissioned, xii 236; notes on machinery, xiv 1; progressive trials, xiv 181; coal consumption, xv 366, 379; comparison with *Mississippi* and *Idaho*.....xvi 38
Keeley motor, post mortem revelations.....xi 207
Keels, bilge, advantages of.....v 824
Kefal, Rus., data, xiii 304; speed.....xiv 994
Kendall, Edward, and Sons, riveted joints.....viii 727
Kennedy, Prof. A. B. W.—Report on the performance of the machinery of the *Meteor*, i 227; report upon trials of three steamers, *Fusi-Yama*, *Colchester*, *Tartar*, ii 340; marine-engine trials, iii 374; trial of the paddle steamer *Ville de Douvres*, iv 409; discussion, experiments on the arrangement of the surface of a screw propeller, v 322; trials of Parsons' steam turbines, v 914; electric transmission of power and electric lighting from the point of view of the mechanical engineer.....vi 550
Kennelly, Dr. A. E.—Edison storage battery.....xiii 669
Kennet, Br., trials.....xvi 1008, 1326
Kensington, mer. str., des., vi 217, 822; boilers, Ellis & Eaves draft, vi 748; trial.....vi 830
Kent, Br., des., xii 559; launch and des., xiii 486; propellers, changes in, xvi 261; engines.....xvi 683
Kent, Prof. William.—Centrifugal pump tests.....xvi 547
Kentucky, des., vii 581, 801; bids, viii 160; launch, x 529; note, xi 781; contract trial, xii 1; trials, xi 1082, xii 823, xiv 298; list of auxiliary machinery, xii 20; coal consumption.....xv 366, 379
Kersaint, Fr., dimensions, viii 191; launch.....ix 810
Key, J.—Factors for safety for marine boilers and engines.....vii 794
Kherson, mer. str., des., vii 618, viii 639; launch, vii 852; boilers compared with *Renown* and *St. Petersburg*, viii 641, 642; boiler tests.....vii 791
Khivinetz, Rus., characteristics.....xvi 368
Khrabry, Rus., launch, viii 200; trials, ix 823; speed.....x 582
Kiev, mer. str., launch.....viii 644
Kilroy stoking indicators.....xvi 1291
King, Charles A. E., Lt., U. S. N.—Discussion, trial trips and the lessons to be learned from them, iii 167; recent performances of the U. S. S. *Oregon*, x 621; coal economy of battleships engaged in blockade duty, x 1043; obituary.....xiii 325
King, Frank B.—Speed in construction a vital factor of naval strength...x 150
King, H. D.—Steam plant of *Iroquois*.....vi 446
King Alfred, Br., dimensions, machinery weights, data, xiii 862; machinery space, xiii 867; launch and des., xiii 1098; compared with *California*, *Gromoboi*, *Victor Hugo*, *König Wilhelm*, xiv 314; note, xiv 955; contract trials.....xiv 1239
King Edward VII, Br., data.....xiii 770, xiv 637

King Edward VII, class, Br., data.....xiv 643
King Edward, mer. str., turbines.....xiii 799
Kingsbury, Prof. Albert.—Experiments with an air-lubricated journal..ix 267
Kingstonian, mer. str., des.....xiii 801
Kingstar, see *Caesar*.
Kingstown and Holyhead mail service steamers, new, 1895.....vii 623
Kinkaid, T. W., Lt., U. S. N.—Discussion, trials of commandant's barge, Navy Yard, New York, i 40; note on screw-propeller action, i 124; feed-water heating, iv 393; discussion, effect of auxiliaries on economic speed and coal endurance, v 105; discussion, experimental station and engineer school, vii 467; contract trial of the machinery of the *Texas*, viii 82; the U. S. S. *Terror* and the pneumatic system as applied to the guns, turrets and rudder, ix 14; machinist apprentice system for the Navy, xiv 222; discussion, organization of the engineer's division on board a man-of-war.....xiv 231
Kirk, Dr. Alexander C., LL. D., discussion, bursting of *Concord's* main steam pipe, iii 416; obituary.....iv 870
Kirk (Brice–Douglass) valve gear.....iii 551
Kirkaldy evaporators.....vii 491
Kirkaldy feed heaters.....iv 398
Kit, Rus., data.....xi 532
Kléber, Fr., engines, xiii 289; launch and data, compared with *Bayan*, *E. Esmeralda* and *Garibaldi*, xiv 1255; trials.....xvi 349
Klotz system of forced draft.....i 330
Klug valve gears.....iii 540
Knapp roller boat.....xi 210
Kniaz Potemkin Tavritchesky, Rus., des., xiv 359; engine trial, xiv 682; data, xiv 994; trials.....xvi 368
Knight Bachelor, mer. str., des.....vi 839
Kollock, F. N., Jr.—Electricity at the New York Navy Yard.....xiii 980
Komet, Ger., speed.....vii 828
König Wilhelm, Ger., compared to *King Alfred*, Br., xiv 314; data.....xiv 334
Königen Luise, mer. str., launch and data, viii 861; des.....ix 828
Korea, mer. str., des., xiii 317; des. and trials.....xiv 380
Krell–Schultze gas analysis apparatus.....xvi 984
Kreuzpointner, P.—Bending tests and contraction of area as proofs of quality of steel.....iv 764
Kronprinz Fr. Wilhelm, mer. str., data of quadruple-expansion engines.....i 78
Kronprinz Wilhelm, mer. str., des., xiii 530, 1134; data.....xiv 1272
Kronprintz, mer. str., trials.....vi 590
Kroonland, mer. str., engines.....xiv 369
Krupp method of steel forgings.....x 1016
Kumano Maru, mer. str., des.....xiii 802
Kurfuerst Friedrich Wilhelm, Ger., launch and des., iii 465; coal-consumption and boiler data.....xiv 116
Kutz, Geo. F., Chief Engr., U. S. N.—A compressed air system of forced draft, i 330; reply to discussion.....i 334

L

L, second-class triple-screw cruiser, Ger., dimensions, vii 828; details, viii 551, 556
La Belle Sauvage, yacht, des., vi 842; trial ..... vii 199
Labor of discovering a new element ..... xi 1078
Labor, proportion before and after launching for various types of vessels ..... xiii 964
Labor-saving devices, effect on size and cost of warships ..... xv 350
Laboratory: mechanical, Royal Technical High School, Berlin, xv 1040; naval engineering, scope and purpose ..... xv 512
La Bourgogne, mer. str., data ..... vi 162
La Cecille, Fr., des ..... iii 135
Ladew yacht, des ..... xi 813
Lady Francis, yacht, des ..... xii 582
Lagging and clothing of steam-heated surfaces ..... x 708
Lagging, service defects ..... xiv 9
Lagrafel-D'Allest boilers: v 938, vii 368; des. and management of, vii 365; of *Bouvines*, Fr., test, vii 402; compared with others, xiv 424; ships fitted with, data ..... xiv 500
La Gascogne, mer. str., machinery accident ..... vii 139
La Hire, Fr., dimensions, viii 190; boilers ..... xii 569
Lahn, mer. str., bursting of copper steam pipes, iii 410; dimensions and data ..... iv 102, vi 162
Laird boilers: compared with others, xiv 426; ships fitted with, data, xiv 500
Laird-Normand boilers: in navies, xvi 292; in *Topaze* and *Diamond*, Br., xvi 1246
Lake Manitoba, mer. str., des ..... xiii 804
Lake steamer, new, 1898 ..... x 275
Lake steamers: building, Cleveland S. B. Co., dimensions, vii 178; cargo, *Victory* and *Zenith City*, des ..... vii 177
Lake Superior ores, data ..... v 148
Lakes, The Great, of North America, v 140; commerce on ..... v 153
Lalande, Fr., speed ..... iii 601
La Lorraine, mer. str., data, x 924, xi 1122, xiv 1272; speed ..... xii 848
La Marguerite, mer. str., des ..... vi 636
Lambert, Professor.—Discussion, water-tube boilers ..... viii 511
Lamps, electric, economy of ..... x 404
La Navarre, mer. str., des ..... vi 218
Lancaster, method of examination of main injection valve ..... i 88
Lancaster, Br., launch and des., xiv 639; trials, xvi 258; engines ..... xvi 683
Lancier, Fr., comparative data ..... ix 35
Lang, Chas.—Evaporators ..... ii 503
Lang radial valve gear ..... xii 757
Langton.—Discussion, transmission of heat through tube plates ..... v 459
Languedoc, mer. str., alteration of old machinery to high-pressure compound by Ashlin's system ..... viii 157
La Normandie, mer. str., data ..... vi 162

Lansquenet, Fr., des., v 1063, vi 206, 807; trials and breakdown.....vii 430
Lanterns, Niclausse boilers.....xiii 381
La Plata, mer. str., cylindrical boilers of compared with Belleville on *Polynésien*.....viii 152
Lapwing, Br., des. and trials.....i 260
Large Atlantic cargo steamers.....xi 703
Large pillar crane.....v 193
Largest cargo steamer, *Samoa*.....iv 867
Largest drydock on the Great Lakes.....iv 783
Large steamship companies of the world.....iv 801
La Savoie, mer. str., data, x 924, xiv 1272; des.....xiii 804, 1133
Latest type Babcock & Wilcox marine boilers, discussion of.....xvi 1223
Latharna, yacht, launch.....ix 449
Latona, Br., launch and des., ii 420; trial, iii 266; performance data, iii 597, v 504; compared with new cruisers, viii 561; machinery data, viii 568
Latouche-Treville, Fr., des., ii 235, iv 841; cost and weights, ii 422; trials and data.....vii 172, 429
La Touraine, mer. str., des., i 362, iii 611; launch, ii 432; indicator cards, iv 134; data.....vi 162
Laubeuf, M., Chief Constructor French Navy.—Note on the direction of rotation of propellers on twin-screw war vessels, xv 1175; rotation of propellers, discussion of.....xvi 95
Launches: Electric, vi 698; steam, first naval, ix 133; steam, light draught, speed and power trials of, x 183; White, patent turnabout...ii 222
Launching strains, *Hopkins* and *Hull*.....xv 712
Lavoisier, Fr., trials.....x 574
Lawrence, destroyer *No. 8*, named, x 818; launch, xii 1096; full data, xiii 1082; des. and contract trial.....xv 667
Laws of similitude regarding questions of naval construction.—Normand.....vii 284
Lay, John Louis.—Obituary.....xi 549
Layman, Alfred C.—Description and trials of the U. S. torpedo-boat destroyers *Hopkins* and *Hull*.....xv 694
Leaky boiler tubes.....iv 507
Lebanon, data.....x 534
Le Chatelier pyrometer for testing temperature of molten metals.....x 1010
Lechner, E., Marine Archt., Imperial German Navy.—Artificial draft and its effect on boiler construction.....iii 349
Lectures before Naval War College.—Hollis, iv 637; McFarland.....vi 647
Leda, Br., launch, iv 832; details, v 226; des., v 510; des. and trial, vi 200; trials.....v 1060, xvi 258
Lee, Br., trials, xiii 271; coal consumption.....xiii 281
Legaré, revenue cutter, test of condenser and evaporation.....xiii 343
Leger, Fr., launch and des.....iii 603
Lehigh anthracite coal, tests of under Corliss boilers.....i 299
Leipzig, Ger., dimensions, vii 827; triple screws, viii 551; details, viii 406, 556
Leitch, Robert Rose, Chief Engineer, U. S. N.—Obituary.....xi 548

Leonard, S. H., Asst. Engr., U. S. N.—New crank-shaft brasses for *Fish Hawk*, i 174; tubulous boilers, ii 163; reply to discussion, ii 211, 401; discussion, trial trips and the lessons to be learned from them, iii 175; preservation of marine boilers, iii 179; method of molding a cylinder in dry sand at the Bath Iron Works, iv 159; failure of a cast-steel piston on the *Charleston*.....vii 789
Léon Gambetta, Fr., data, xii 839; launch, xiii 1090, xiv 328; ready for trial, xvi 349; trials.....xvi 696, 1330
Leonidas, data.....x 824
Leon Pauilhac, yacht, dimensions.....ix 449
Leopard, Br., launch.....ix 421
Leopard, Aus., experiments with in- and out-turning propellers.....xvi 126
Leopold, H. G., Lieut., U. S. N.—Note on the development of cylindrical heads for steam boilers, iii 221; theory of the centrifugal pump, Part I, iii 335; Part II, iii 483; circulating pumps, v 295; some experiences with the U. S. torpedo boat *Goldsborough*.....xv 778
Lepanto, Sp., characteristics.....iii 142
Lessons from the destroyed Spanish ships.....x 1128
Letter from Delaunay, Belleville & Co., commenting on the report of trials of H. M. S. *Hyacinth* and H. M. S. *Minerva*.....xiv 905
Leviathan, Br., launch, xiii 1109, xiv 640; launch and des., xiii 775; trials, xiv 950; des. and contract trials, xiv 955; trial results.....xiv 1241
Levrier, Fr., torpedo scout, trials.....iv 845
Lewes, Prof. Vivian B.—The spontaneous ignition of coal; extract.....iii 577
Liban, mer. str., tests of Lagrafel-D'Allest boilers.....v 949
Libertad, Arg. Rep., des.....v 229
Libertad, Chili, des. and trial.....xvi 265
Lieutenant Kassarsky, Rus., see *Kassarsky*.
Life boat, hydraulic, *Queen*, oil-fuel experiments on.....x 385
Liffey, Br., launch.....xvi 1326
Lifting and hauling appliances in Portsmouth dockyard.....iv 777
Light-draught: river gunboats, x 783; paddle steamers for upper Nile, iv 836; steamers.....x 509
Lighter *No. 18*, auxiliary navy, x 536; data.....x 824
Lighting, electric, of ships.....iii 510
Lighting plant, electric, Government Hospital for the Insane, Washington, D. C., construction, installation and performance.....ix 237
Lighting plant, ship.....iv 802
Lightning, Br., launch and des., vii 425; accident to, viii 172; des. and trials.....viii 835
Lignum vitae: fitting in bearings, *Oregon*, xiv 260; linings, renewing.....xiv 529
Liguria, It., progressive trials.....viii 199
Liguria class, It., characteristics.....iii 142
Liguria, mer. str., des. and trials.....v 1075
Lillie, multiple-effect distilling plant, Dry Tortugas, tests.....xii 85
Lime in feed-water, French naval regulations on.....vii 407
Limitations of Thermo-dynamics.....xii 219

Limits of economical speed of ships.....xiii 661
Lincoln, J. M.—Comparison of typical ocean steamers, vi 162; trial data of steamships.....vi 590
Lines for shafting, method of running, *Cincinnati*.....v 1
Lines of vessels, effect on speed and wave form.....i 33–98
Lining bearings, alloy for.....xiv 1229
Lining up shafting.....ix 726
Linings, lignum vitae, renewing.....xiv 529
Linnard-Chandler, report on torpedo boats and destroyers.....xiv 282
Linois, Fr., des.....iv 842
Linotype machine.....xii 208
Linseed oil, raw, for preserving steel.....xv 634
Liquid air, as a means for the manufacture of oxygen, xii 447; cost of, xi 724
Liquid fuel: vii 700, ix 781, xi 1072; Soliani, vii 751; Hoffman, xv 231; at sea, vi 417; advantages, vii 746; burners, xv 245; comments on, vi 679; disadvantages, vii 762; experiments, xi 720, xiv 580; explosion on *Progreso*, mer. str., xv 272; for naval purposes.—Edwards, vii 744; McFarland, vii 68; Holden system, vii 750; in combination with coal, vi 415; on Russian torpedo boats, ix 138; new method of burning, xiv 267; practical test, *Tanglin*, mer. str., xiv 609; pumping system, xv 252; report, xvi 719; Russian merchant marine, xiv 609; tests in Diesel motor, xi 77; trial trip, *Trocas*, mer. str., xiv 268; use in torpedo boat *Sunderland*, ii 244. See oil fuel.
Liquid-steel compression.....xiv 275
Liquifaction of hydrogen.....x 775
List of members of the Society, 1891, iii 149; February, 1892, iv 147; February, 1892, additions and corrections, iv 328; 1893, v 259; 1893, additions and corrections, v 531; 1894, vi 229; 1895, vii 203; 1896, viii 223; 1897, ix 223; 1898.....x 315
List of vessels of the U. S. Navy.....xi 1090
Little, W. N., Lt. Comdr., U. S. N.—Discussion, electric lighting of ships, iii 521; *Cushing* tests, Board, iv 36; discussion, organization of the engineer's division on board a man-of-war.....xiv 228
Lively, Br., trials.....xiii 491, xiv 208
Lleyellyn, yacht, des.....x 616
Lloyd's formulae for Fox's corrugated furnaces.....iv 257
Lloyd's rules for shafting, changes in.....xii 794
Loam molding and casting cylinders, *Cincinnati* and *Raleigh*.....iv 376
Loanda, mer. str., sea-voyage performance.....xiii 834
Lockart, Wm. S.—Discussion, determination of dryness of steam.....vii 322
Locomotive boilers: loss of heat, xi 493; Purdue, tests, xiii 70; tests, ii 170; tubes, 20-foot, for.....xii 1050
Locomotives and torpedo boats, comparison, oil fuel.....xvi 823
Locomotives, center of gravity.....xi 1040
Locomotive cranes.....vi 147
Locomotive slide valves, friction of.....xi 478
Locust, Br., launch, ix 174; coal consumption, x 237; trials.....x 571
Loewe's machine tool works, Berlin.....xi 1009

Lofty smokepipes.....iii 453
Log, the patent, is it maligned?.....ii 227
Logarithmic Tables.—Jones, book received.....v 251
Logical arrangement of the motive power of warships.—Melville, xi 641; discussion: Sandison, xi 663; Seaton, 665; Biles, 669; White, 672; Quick, 677; Norton, 679; Hopetoun, 680; Barnaby..... 681
Lombardia, It., progressive trials.....viii 198
London, Br., launch and des., xi 1097; trials.....xiv 641
Londonderry, mer. str., turbines, steam, xvi 629; propellers.....xvi 631
Long, Admiral, R. N.—Discussion, transmission of heat through tube plates.....v 461
Longevity and service of modern steamers.....v 1029
Longmoon, mer. str., data and trial.....viii 655
Longridge, Michael.—Experiments on triple-expansion pumping engine, vii 215; discussion, determination of the dryness of steam.....vii 316
Longstreth, Charles.—Metallic packings, principles of design essential for successful development.....xv 404
Loomis, Geo. W., mer. str., explosion of oil fuel.....xvi 1273
Lord, N. W.—The valuation of coals.....xi 92
Lord Nelson class, Br., new battleships.....xvi 1320
Lorena, yacht, turbines, steam.....xvi 715, 1095
Loring, Chas. H., Chief Engineer, U. S. N.—Discussion, tubulous boilers, ii 194, 394; *Cushing* tests, Board, iv 36; discussion, experimental station and engineer school.....vii 462
Lorraine, mer. str., des.....vii 196
Loss of H. M. S. *Victoria*.....vi 47
Losses: Feed water per day, U. S. S. *Minneapolis*, x 9; heat, by smoke, iv 802; heat, from locomotive boilers, xi 493; heat, in steam engines, xi 949; power, in the machine shop.....xii 119
Lossos, Rus., data, xiii 304; launch, xiv 682; speed.....xiv 995
Lothringen, Ger., launch.....xvi 1015
Louisiana, des., xiv 935; bids, xiv 1233; launch.....xvi 996
Louisiana, mer. str., des., new machinery.....vi 820
Lovekin, Luther D.—*Mongolia*, description and trial, xvi 238; balance cylinders.....xvi 896
Lowe, John, Chief Engineer, U. S. N.—Economic marine propulsion, iii 218; discussion, engine room signals.....iii 440
Lubeck, mer. str., crank pin fractured.....iii 456
Lubeck-München, Ger., launch.....xvi 1017
Lubricants, oils and greases.—Redwood, book received.....x 619
Lubricating (self-) high-speed steam engines.....ix 689
Lubrication: air, for journals, ix 267; rational, of marine engines.....iii 571
Lucania, mer. str., iv 856; bunker capacity, v 1069; records, Sept., Oct., Nov., 1893, v 1019; first voyage, v 1069; time of runs, etc., vi 438, 790; data.....xiv 1272
Luchs, Ger., coal-consumption and boiler data, Thornycroft.....xiv 117
Luckenbach, W. A. See *Uncas*.
Ludion, Fr., submarine, data.....xiii 781

Lyall boiler ..... vi 360
Lykens Valley anthracite coal, analysis ..... x 112
Lynx, Br., preliminary trials, vi 614; trials, vi 804; accident, vii 170; repairs, vii 821; grounding ..... ix 807
Lynx, Fr., data ..... xiii 781
Lyra, mer. str., des. ..... xiii 805
Lysistrata, yacht, data, xii 1131; des. ..... xiii 556

M

M2, Fr., data ..... ix 178
M, second-class cruiser, Ger., triple screws, viii 551; note, viii 631; boilers ..... ix 815
Macalpine, John H.—On the inertia stresses of a slide valve, vi 272; on crank shafts, viii 665, ix 42, 318, 482; inertia stresses of elastic gears, xii 329, 603, 913; description and trials of the U. S. torpedo-boat destroyers *Hopkins* and *Hull* ..... xv 694
Macdonough, destroyer *No. 9*, named, x 818; launch and des., xiii 255; full data, xiii 1082; des. and contract trial ..... xv 667
MacGregor, Josiah.—Discussion, present position of water-tube boilers for marine purposes ..... v 957
Machias, gunboat *No. 5*, i 351; bids, ii 206; launch, iv 117; work on, iv 294; trials, v 720; des. and contract trials, v 846; alterations in, vi 176; air pump data, vi 532; steaming radius ..... xiii 60
Machine and hand labor ..... xii 455
Machine construction in Austria ..... xi 219
Machine shops: Chicago Shipbuilding Co., x 515; destruction by fire, New York Navy Yard, xi 185; power losses in ..... xii 119
Machine tools: Electric drive, in shipbuilding works, xiii 951; power losses, xii 124; power required for, xi 756; works, Loewe's, Berlin. .xi 1009
Machinery: and coal endurance of the new cruisers.—Hollis, iv 637; arrangement for triple screws, xi 653; auxiliary, *Kentucky*, xii 20; *Wisconsin*, xii 992; bearings.—Dewrance, ix 104; care of, iv 726; care of in British Navy, xiv 271; castings, fillets and round corners in, ix 1010; *Charleston*, defects developed on chase of *Ilata*, iv 364; data, British warships, vii 348; defects in *Medea*, Br., i 258; defects in, reserve torpedo-boat flotilla, xv 770; defects in, under high pressure, xii 719; details and arrangement, Boiler Committee report, xiv 872; French naval vessels, contracts with private builders, iv 480; *Galatea*, Br., defects in, i 260; handling cargo by, xiii 183; in action, casualties and management of, vii 57; inspectors of, afloat, in the British Navy, iv 113; interchangeability of units, xii 104; *La Gascogne*, mer. str., accident to, vii 139; light, criticism of in British maneuvers, i 90; marine, details of construction and arrangement, xiv 1; naval, improvement in installation of, xvi 98; nominal efficiencies, xi 763; of British war ships.—Durston, vii 322; of British war ships, trials, 1899, xi 304; of new cruisers, space occupied, i 249; of the torpedo boat *Cushing*.—Potts, ii 215; progress in,

xi 928; proportions and weight in fast ocean steamships, v 826; refrigerating, iv 783; space occupied by, naval and merchant vessels, xiii 867; steam cutter, standard, U. S. Navy, xiv 37; trial, *Barham*, Br., v 743; trials, *Galatea*, Br., v 743; trial, *Niger*, Br., v 743; weights, (see Weights, machinery); *Bancroft*, v 376; *Bennington*, iii 212; criticism on allotment, v 103; *Cushing*, iv 15; *Hudson*, U. S. R. C., v 707; *Monterey*, v 134; *New York*, v 630; per I.H.P. in various classes of vessels, ix 692; *Philadelphia*, ii 531; *Royal Sovereign*, Br., iv 298; *San Francisco*, ii 548; *San Francisco* and *Trenton* compared, iv 723; *Ville de Douvres*, mer. str.....iv 413, 546
Machines and structures, similar.....xi 976
Machinist apprentice system for the Navy.—Kinkaid.....xiv 222
Machinists, duty of.....xvi 1177
Machining propeller blades.....xvi 911
Mackensie, torpedo boat *No. 17*, launch, x 533; data, x 818, xiii 1082; speed, x 827; trials.....xi 234, 892
Magee, Geo. W., Chief Engr., U. S. N., *Cushing* tests, Board.....iv 36
Magnalium.....xii 808
Magicienne, Br., progress on, i 87; trials, i 178; defects on trials, i 255; des., i 264; boilers, defects in, iv 279; boiler data.....iv 507
Magnesic chloride, scale in boilers.....iv 686
Magnesium chloride, corrosion of boilers by.....xiv 1214
Magnet, Aus., data, ix 405; trials.....viii 805
Magnetic appliances for shop and ship.....xii 516
Magnificent, Br., des., v 516, v 1038; launch and des., vii 161; trials, vii 811, xi 318
Magpie, Br., trials.....i 261
Magoun, H. A.—U. S. torpedo-boat destroyers *Truxtun*, *Whipple*, *Worden*.....xv 393
Mahony, D. S., Lieut., U. S. N.—U. S. battleship *Maine*, xiv 1123; speed and coal-consumption curves, xv 366; official trials of the submarine boats *Plunger*, *Porpoise* and *Shark*.....xv 859
Maida, mer. str., des.....x 604
Main, mer. str., reconstruction.....xiii 1141
Main and auxiliary machinery, steam consumption of, U. S. S. *Minneapolis*.....x i
Main, Herschel, P. A. Engr., U. S. N.—Discussion on "Some Lessons from Samoa," i 212; discussion, engine-room signals.....iii 450
Main injection valve, *Lancaster*, method of examination of.....i 88
Maine, Act of Congress, x 798; des., x 1163; launch, xiii 770; builder's trials, xiv 948; des. and contract trials, xiv 1123; Niclausse boiler report, xv 951; progressive trial.....xvi 526
Maine, old, des., i 175, authorization and data, i 236; work on, ii 411, iv 291; launch, ii 577; speed curves, iii 556; and cruiser *No. 11*, failures of steel castings, iv 83; dock trial, v 719; torpedo boats for, v 729; vi 526, vii 24; official trial, vi 792; des. and contract trial, vii 1; engines and cylinders, number of, vii 28; explosion, x 221; court of inquiry.....x 529

Maine, mer. str., des. and trials.....xiv 323
Majestic, Br., des., v 516, 1038; launch and des., vii 167; trials, vii 812, xi 318; machinery data, viii 568, xi 330; progressive trials, viii 811; data, xi 241; machinery space.....xiii 867
Majestic, mer. str., des.....i 167, 360, iii 288
Majpu, Arg. Rep., data.....xiv 949
Malay, yacht, des.....x 934
Mallard, Br., data, vii 820; des., viii 182; launch, ix 174; trials.....ix 804
Malleable cast iron.—Wheeler.....xi 161
Mallory, C. K., Lt., U. S. N.—Discussion, steam consumption of the *Minneapolis*, x 72; Pacific mail steamship *Korea*, xiv 380; des. and trials of the U. S. monitor *Arkansas*, xiv 1172; power plant, St. Louis exposition.....xvi 1139
Management of Belleville boilers at sea.—Baker.....xvi 642
Manchester City, mer. str., launch.....x 922
Manchuria, mer. str., balance cylinders.....xvi 903
Maneuvers, English naval, 1888, i 169, 264; 1892, iv 786; mishaps in, iv 837
Maneuvering ability of triple-screw vessels.....xiii 404
Maneuvering powers, battleships, *Royal Sovereign* class.....vi 493
Maneuvering qualities of battleships, in-turning vs. out-turning screws, xv 433
Maneuvering quality of twin-screw vessels, influence of inward- and outward-rotating propellers.....xvi 119
Manganese: effect in cupola practice, x 1049; production of, xii 1053; Bronze, Parsons', iii 491; steel.....iii 505, v 483
Mangini, Fr., speed and dimensions.....ix 178
Mangrove, data.....x 534
Manila, steaming radius.....xiii 60
Manitou, mer. str., des.....v 524
Manly, data.....x 534, xiii 1082
Manning, U. S. R. C., launch, ix 140; des. and contract trial, ix 711; data.....x 534
Manning, Chas. H., P. A. Engr., U. S. N., retired.—Discussion, tubulous boilers, ii 194; discussion, experimental station and engineer school, vii 457; education of naval engineers for future needs.....xv 850
Man-of-war, see Naval vessels.
Manola, mer. str., Minnesota S. S. Co., statement of operations, expenses, etc., season, 1890.....v 151
Manora, mer. str., trials.....vi 590
Mansfield, Newton, Lt., U. S. N.—Seamless-steel boiler tubes, their limited endurance as a menace to naval efficiency.....xv 417
Manual of naval architecture.—White, book received.....vi 443
Manufacture: and inspection of iron and steel boiler tubes.—Hall, ii 301; discussion.—Hunt, ii 306; of aluminum.—Ristori, x 755; of cellulose, xiii 195; of open-hearth steel castings.—Hall, i 185; of oxygen, liquid air as a means, xii 447; of solid-drawn steel tubes, ix 773; of steel castings in the United States, xi 225; of steel plates, notes on inspection and.....i 128

Manxman, turbine str., steam turbines, xvi 629; launch, xvi 1023; trials and des. ..... xvi 1339
Maple, data ..... x 534
Marathon, Br., progress on, i 87; trials, i 256; des., i 265; boilers, defects in, iv 279; boiler data ..... iv 507
Marblehead, cruiser *No. 11*, i 253, 294; des. and bids, i 350; launch, iv 516; des. and contract trials, vi 129; air-pump data, vi 532; steaming radius ..... xiii 60
Marceau, Fr., des. and trial ..... iii 273
Marcellus, data, x 824; towed, coaling *Massachusetts* ..... xiii 35
Marco Polo, It., des. and trials ..... viii 633
Marconi wireless telegraphy, naval tests ..... xi 776
Margaret, yacht, des. ..... x 931
Margarita, yacht, des., vi 441, viii 660; dimensions, viii 213; speed, viii 873; data ..... xii 270, xiii 323
Margarita II, yacht, correction of name ..... ix 446
Maria Teresa, Sp., see *Infanta Maria Teresa*.
Marie Henriette, mer. str., des. ..... vi 431, v 1086
Marie Rickmers, mer. str., data ..... viii 425, 654
Marietta, bids and contract, vii 804; des., vii 583; named, viii 799; launch, ix 401; des. and contract trial, progressive, ix 641; performance, x 221; steaming data, x 826; steaming radius, xiii 60; performance of Babcock & Wilcox boilers ..... xv 59, xvi 1223
Marietta, yacht, des. ix 207; launched ..... ix 446
Marietta II, yacht. See *Margarita II*. Machinery. ..... ix 211
Marine boilers: care of.—Forsyth, v 574; compound, viii 477; construction.—Stromeyer, v 890; defects of, in British Navy, discussed and remedies suggested, v 327; furnaces.—Morison, v 11; discussion, Milton, 413; Geddes, 417; Walliker, 418; Morison, 420; furnaces, formulae, factors of safety, etc., v 431; methods of introducing feed water, v 984; particularly in reference to efficiency of combustion and higher steam pressures.—Fothergill, viii 764; discussion, Gravell, 773; Reavell, 774; Nodder, 775; preservation of ..... iii 179
Marine economics, lecture.—McFarland ..... vi 681
Marine engine: the.—Hollis, iv 712; the development of in the last decade.—Bieg, i 151; trials.—Kennedy, iii 374; works, power required, xiii 1058
Marine engines: balancing, iv 246; bearings, ix 118; dynamical action in shafting, xiv 721; converted, iv 780; essentials of good design, xiv 18; losses of feed-water, vii 486; lubrication of, iii 571; modern, auxiliary machinery with, iii 583; modern, lectures.—McFarland, vi 647; record of continuous performance, method of determining, ix 1; rotary vs. reciprocating, advantages and disadvantages, ix 569; use of various vapors in, xiv 577; waste of power in ..... iv 655
Marine engineering: in 1897, x 207; review of, during the past ten years, xiii 827; some details in.—Mudd ..... iii 238
Marine machinery: details of construction and arrangement, xiv 1; experiments for Belleville boilers, iii 119; table showing progress in, vi 652

Marine propulsion: calculation of horsepower for, viii 310; economic.—Lowe.....iii 218
"Marine Review," book received.....x 304
Marine shafting, forgings, notes on.....xiv 226
Marine steam engine.—Sennett and Oram, book received.....x 303
Marine steam turbines, see Turbines, steam.....xvi 627
Marine steam turbine, the.—Parsons, xiii 432; discussion, Denny, 437; Jamieson, 438; Alexander..... 439
Marine turbines for the German Navy.....xv 603
Maritime commerce, future of .....x 1104
Mariposa, mer. str., oil-fuel installation.....xvi 788
Markham, E. R.—Hardening extra-long stay-bolt taps, xiv 595; case-hardening wrought-iron and machine steel.....xiv 590
Marqués de la Victoria, Sp., launch.....ix 437
Mars, Br., launch, viii 386; trials, ix 407, xi 318; oil-fuel furnaces.....xiv 642
Marseillaise, Fr., trials, xvi 349; boiler trials.....xvi 460
Marseilles, Fr., mishap.....xiv 1254
Marshal Deodoro, Brazil, note, ix 141; data, ix 405; des.....x 836
Marshal Floriano, Brazil, note, ix 141; launch.....xi 782
Marshall valve gears: iii 538; note, ii 248.—Hollis, ii 1; analyses.....xii 664
Marshall, F. C.—Discussion, bursting of *Concord's* main steam pipe...iii 417
Martell.—Discussion, watertight doors.....viii 341
Martin's system of induced draft. .....ii 567
Maryland, characteristics, xii 810; dock trials.....xvi 996
Maschmeyer, A. M. P.—Translation, steam cutter for the German Navy, xiii 423; standard steam-cutter machinery of the U. S. Navy.....xiv 37
Massachusetts, authorization and des., ii 409; changes in and bids on, ii 575; work on, iv 292; launch, v 721; dock trials, vi 602; des. and contract trials, viii 237; engines and cylinders, steam, list of, viii 265; coal consumption, xv 366, 379; coal economy on blockade duty, x 1044; coaling from *Marcellus* in tow, xiii 35; steaming radius, xiii 60; progressive trials..... xiv 181
Massasoit, data.....x 824
Messéna, Fr., triple-screw, des., iv 315, ix 423; launch and des., vii 603; preliminary trials, x 576; trials.....x 878
Mathematical theory of naval architecture, advance in, etc.....ix 730
Mathews, C. H., Lt., U. S. N.—The contract trials of the U. S. gunboat *Annapolis*, ix 560; des. of the steam engineering plant at the Navy Yard, N. Y.....xiii 872
Matsushima, Jap., work on, ii 429; des., iv 316; mention in battle of Yalu .....viii 372
Mattice, A. M., P. A. Engr., U. S. N.—Discussion, trials of commandant's barge, Navy Yard, New York, i 33; discussion, "Some lessons from Samoa," i 220; phenomena attending ship propulsion, i 223; discussion, speed trials of fast ships, ii 81; discussion, tubulous boilers, ii 396; discussion, trial trips and the lessons to be learned from them, iii 161; discussion, effect of auxiliaries on economical speed and coal endurance, v 95; arrangement of machinery for full power and for cruising.....v 100

Mattison, A. Geo.—Data on compression.....xiii 422
Maudslay evaporators.....vii 492
Maxima and minima curves, non-algebraic, treatment of by use of ordinates.....iv 71
Maximum steam-jacket efficiency.....iii 422
May, Captain, R. N.—Discussion, design of a fast scout.....xiii 417
Mayflower, data, x 534; steaming radius.....xiii 60
Mayflower, mer. str., Fall River Line, des.....iv 848
Mayflower, yacht. See *Suwanee*. Dimensions.....ix 210, x 534
Mayo, 25 de, Arg. Rep., des. and trials, iii 140; performance data, v 504; data compared with protected cruisers.....xii 1015
McArthur, auxiliary navy, x 537; data.....x 824
McAllaster, E. L.—Notes on performance of S. S. *City of Alpena*.....v 973
McAllister, Chas. A., U. S. R. C. S.—The official trial of the revenue cutter *Hudson*, v 703; new revenue cutters, vii 561; contract trial of the *Gresham*, ix 253; the contract trials of the U. S. revenue cutters *Manning* and *McCulloch*.....ix 711
McCulloch, launch, ix 140; des. and contract trial, ix 711; data.....x 534
McFarland, W. M., P. A. Engr., U. S. N.—Increase of horsepower for a given speed due to a foul condition of ship's bottom, i 73; contractor's full-power forced-draft trial of the U. S. S. *Yorktown*, i 137; contractor's full-power forced-draft trial of U. S. S. *Baltimore*, i 337; speed trials for fast ships, ii 68; discussion, speed trials of fast ships, ii 91; discussion, new forms of evaporators, ii 503; trial trips and the lessons to be learned from them, iii 149; the proposed revision of the rules of the steamboat inspection service, iv 210; discussion, air pumps, vi 536; the modern marine engine, boilers, etc., lectures before Naval War College, vi 647; trial trips, etc., lecture before Naval War College, vii 33; practical hints in connection with the "Problem," lecture before Naval War College, vii 57; discussion, experimental station and engineer school, vii 479; discussion, steam consumption of the *Minneapolis*, x 57; discussion, trials of the Niclausse safety water-tube boiler, x 119; discussion, boiler testing with various fuels, x 147; discussion, speed of construction, a vital factor of naval strength, x 161; electrical plants for shipyards.....xvi 309
McKean, F. G., Chief Engr., U. S. N.—Some lessons from Samoa, i 209, 222; slow combustion of iron, i 364; is the patent log maligned? ii 227; discussion, red-hot furnace-crown experiments, iii 431; discussion, engine-room signals, iii 443; discussion, air pumps, vi 534; translation, note on the direction of rotation of propellers on twin-screw war vessels, xv 1175; rotation of propellers.....xvi 95
McKechnie, James.—Review of marine engineering during the past ten years.....xiii 827
McKee, torpedo boat *No. 18*, launch, x 533; data.....x 818, xiii 1082
McLane, auxiliary navy, x 537; data.....x 824
McPhail & Simpson's superheater, des. and tests.....viii 353
Mean effective pressure from calibration tests for continuous record of marine engines.....ix 7

Measures, metric system.....xi 467
Measured mile, for progressive trials, iv 600; Newport, R. I., survey of.....iv 608
Measured-mile trials: see progressive and standardized screw trials, ii 93, iv 587; discussion, ii 70; at Newport, *Atlanta*, *Boston*, *Chicago*, *Yorktown*, i 352; vs. measured course, with turn, iv 604; *Bancroft*, v 204, 377; *Decatur*, xiv 71; *Marietta*, ix 652; *Rodgers*, ix 684; *Shubrick* and *Thornton*, xiii 602; *Vicksburg* and *Newport*, ix 557; *Wheeling*.....ix 651
Measurement of feed and circulating water, etc., by chemical means.—Stromeyer.....viii 517
Measurement of speeds of large, fast vessels.....ii 93
Measurements of temperatures of steam.—Jacobus.....viii 115
Measurement of wave currents.....v 869
Measuring the speed of small motors.....xi 439
Mechanical: apparatus of warships, xi 1051; burners, oil, xvi 835; engine signals, iii 204; engineer's pocketbook, etc.—Clark, book received, iv 143; engineer's reference book.—Foley and Pray, book received, iii 458; engineering and shipbuilding, xi 744; equivalent of heat, i 39; draft, book received, x 304; draft, advantages over chimneys for boiler furnaces, xi 222; draft, economy of, xii 486; draft systems, closed stoke hole, Howden, Ellis & Eaves, and closed ash pit, compared, viii 140; drafts, comparison of, viii 140; drawing.—Bartlett, book received, xiv 374; heating and ventilation, xii 1074; laboratory of the Royal Technical High School of Berlin.—Mentz, xv 1040; stokers, xii 466; stokers, for marine use, xi 67; stokers, Crowe, *John W. Gates*, xii 901; stokers, *Pennsylvania*, mer. str., xi 561; stokers, Roney, power plant, Navy Yard, N. Y.....xiii 985
Mechlenburg, Ger., des. and trials.....xvi 359, 360
Medea, Br., des. and trials, i 87; defective boilers, i 255, iv 279; defects in machinery, i 258; des., i 265; boiler data, iv 507; Yarrow boilers, xiv 643, xvi 336
Medea, *Medusa*, Br., comparative trials, xvi 336; boilers.....xvi 919
Medina, Br., des.....i 267
Medjidia, Turk., launch and des.....xvi 705
Medusa, Br., nearing completion, i 87; trials, i 178, 255; des., i 267; boilers, defects in, iv 279; boiler data, iv 507; performance data, v 504; Dürr boiler.....xiv 643, xvi 336
Medusa class, Br., cost of and influence of foul bottom on speed.....ii 420
Medusa, *Medea*, Br., comparative trials, xvi 336; boilers.....xvi 919
Medusa, Ger., launch.....xiii 297
Medway, Br., des.....i 266
Megaphone with a siren whistle.....xii 223
Meier, Col. E. D.—Discussion, steam consumption of the *Minneapolis*, x 66; discussion, trials of the Niclausse safety water-tube boiler, x 126; discussion, boiler testing with various fuels, x 148; the Deisel motor, x 162; reply to discussion, x 182; comparative thermal efficiency of steam engines and Diesel motors, xi 396; revision of the boiler laws of the U. S. steamboat inspection service, xv 382; *Melampus*, Br., trial, iii 460; performance data.....iii 597

Melampus, Br., trials, iii 460; performance data.....iii 597
Mellen, C. J.—Change valve for hydraulic turret-turning engines of *Texas*.....viii 85
Melpomene, Br., progress on, i 87; trials, i 257; des.....i 265
Melting point of cast iron.—Moldenke.....x 1009
Melville, Geo. W., Rear Admiral, Engr.-in-Chief, U. S. N.—Memorandum on 100-foot smoke pipes for *Brooklyn*, v 175; annual report, x 1098; discussion, water-tube boilers a necessity, xi 36; the logical arrangement of the motive power of warships, xi 641; reply to discussion, xi 682; triple-screw ships, xiii 690; the military importance of naval engineering experiments, xv 512; vibrations of *Hopkins* and *Hull*, xv 747; on rotation of propellers.....xvi 123
Members of the Society, see Lists of Members, etc.
Memoranda of Acts of Congress applying to new vessels, 1882.....i 236
Mending of castings.....xiii 205
Menemsha, see *Iris*.
Men-of-war, see Naval vessels.
Men-of-war, German, development in design and construction.....viii 543
Mentz, Walter.—Mechanical laboratory of the Royal Technical High School of Berlin.....xv 1040
Mercantile auxiliaries.—Brassey.....xiii 607
Merchant marine: U. S., xi 535; use of water-tube boilers in.....ix 667
Merchant steamers.
Aberdeen, des., vi 642; machinery, vii 444; *Aco*, engine data, vii 441; *Admiral Dewey*, launch, x 1218; *Admiral Sampson*, launch, x 1218; *Admiral Schley*, launch, x 1218; *Admiral Watson*, launch, x 1218; *Adria*, des., viii 648; speed, viii 867; *Africa* (two), trials, vi 590; *Alabama*, launch and des., iv 858; *Alemeda*, comparison coal and oil fuel, xvi 806; *Alaska*, dimensions and data, iv 102, vi 162; *Alaskan*, des., xiii 310; *Alberta*, trial and des., iv 860; *Alexander Holly*, launch, viii 864; *Alexander McDougall*, des., x 900; *Alexandra*, launch, ix 839; *Alfonzo XIII*, des., i 168; *Algoa*, data, viii 428; *Alleghany*, des., vii 193; *Aller*, data, vi 162; *Alma*, des., vii 191, 439; *Alsace*, des., vii 196; *America*, 1884, dimensions and data, iv 102; data, vi 162; *America*, 1892, petroleum tank steamer, iv 867; *America* and *Kaiserin-Auguste*, des., xvi 1339; *American Maru*, des., x 605; *Andalusia*, launch, viii 867; *Antrim*, des. and launch, xvi 713, 1023; *Apache*, launch, xiii 537; *Arabia*, launch, ix 197; *Arcadia*, launch, ix 197; *Arequipa*, des., i 363; *Arizona*, dimensions and data, iv 102, vi 162; des., x 610; *Arizonian*, des., xiii 310; *Armand-Béhic*, Belleville boilers, viii 153; *Armenia*, des., viii 648; *Artemisia*, data, xiii 537; *Assam*, trials, vi 590; *Asturia*, dimensions, viii 649; *Atlanta*, des., viii 421; Atlantic liners, engineer routine, xvi 886; dimensions and data, iv 102; past, present and future, iv 99; Atlantic record, iii 609; Atlantic Transport Co.'s steamers, xiii 309; *Augjulli*, trials, vi 590; *Augusta Victoria*, des., i 269; dimensions and data, iv 102; data, vi 162; des., viii 862; *Augustus B. Wolvin*, launch and des., xvi 709; unloading record,

Merchant steamers.

xvi 1302; *Aurania*, dimensions and data, iv 102, vi 162; *Australia*, launch and des., iv 863; *Australien*, Belleville boilers, vii 372; Belleville boilers of, compared with cylindrical of *Brésil*, viii 153; *Avon*, des., ix 835, x 279; *Avondale Castle*, des.....ix 204

Baku Standard, vi 416; first successful voyage with liquid fuel, vii 759; *Baltic*, des., xvi 370; *Bangor*, launch, v 1087; *Banshee*, des., vi 840; *Barbarossa*, data, viii 861; des., ix 830; *Batanga*, sea-voyage performance, xiii 834; *Belle of Dunkerque*, comparison of ordinary and Dickinson propellers, v 314; *Bergen*, experiments on ferryboat, ii 251; *Berlin*, boilers, Ellis & Eaves draft, vi 748; bilge keels, x 522; *Black, C. A.*, data, xi 265; *Boadicea*, launch and des., x 277; *Boma*, sea-voyage performance, xiii 834; *Bosnia*, launch and des., x 1213; *Braemar Castle*, des., x 605; *Bremen*, displacement, ix 201; des., ix 831; data, viii 861; reconstruction, xiii 1140; *Brésil*, cylindrical boilers of, compared with Belleville of *Australien*, viii 153; *Briton*, data, x 284; *Britannia*, dimensions and data, iv 102; *Britannic*, data, vi 162; *Bromo*, data of quadruple-expansion engines, etc., i 78; *Brown, Wm. H.*, des., x 600; *Buenos Aires*, data of quadruple-expansion engines, i 78; *Buteshire*, boilers, Ellis & Eaves' draft, vi 748; *Byculla*, trials.....vi 590

Caledonia, des. vi 643, vii 192; *California*, data, xii 852; *Cambrian*, launch and des., ix 199; *Cameo*, Babcock & Wilcox boilers, viii 770; *Campania*, launch and des., iv 852; des., v 247; des. and trial, v 385; speed, v 405, 409, 754; records (Sept. Oct., Nov., 1893), v 1019; data, vi 162; time of runs, vi 438; machinery space, xiii 867; data, xiv 1272; *Campania* and *Great Eastern* compared, v 810; *Canada*, des., ix 197; Canadian Atlantic service, vi 642; Canadian Pacific Railway steamers, i 363; *Cape Ann*, des., vii 624; *Cape Charles*, data, x 602; *Cap Verde*, des., xiii 794; car ferry, *Sainte Marie*, v 759; *Carinthia*, trial and des., vii 843; *Carisbrook Castle*, des., x 285; *Carlow*, dimensions, viii 656; *Caronia*, new Cunard liner, xvi 1020; *Castilian*, data, xi 543; *Cedric*, data, xiv 1278; *Celtic*, des., xiii 516; dimensions, machinery weights, data, xiii 862; machinery space, xiii 867; *Ceres*, trials, vi 590; *Cevic*, launch, v 1076; *Chanda*, trials, vi 590; channel steamer, machinery data, viii 568; *Charles V*, trials, vi 590; *Charles W. Wetmore*, des., iv 453; *Chelydia*, trials, vi 590; *Chesapeake*, launch and des., vii 624; speed, vii 853; *Chicago*, data, x 920; *Chicora*, trial and des., iv 864; *Chile*, Belleville boilers, viii 153; *Chilka*, trials, vi 590; *China*, viii 422; record run, x 276; *Christopher Columbus*, des., v 240; *City of Alpena*, des. and trials, v 973; *City of Bangor*, launch, viii 424; *City of Berlin*, data, vi 162; *City of Buffalo*, des. viii 428; *City of Erie—Tashmoo*, race, xiii 795; *City of Lowell*, des., v 1088; data, vi 633; *City of New York*, des., i 166; transfer to American register, iv 320; (see *New York;*) *City of Paris*, des., i 165; remarkable accident, ii 238; investigation of accident, ii 429; new explanation of accident to, iii 122; repairs to, iii 467; dimensions and data, iv 102; transfer to

Merchant steamers.
American register, iv 320; data, vi 162; accident to, vi 290; (see *Paris*); *City of Rome*, dimensions and data, iv 102; data, vi 162; *City of Trenton*, explosion, xiii 1078; *City of Venice*, data of quadruple-expansion engines, etc., i 79; Clan Line S. S., machinery data, viii 568; *Claudius*, des., xi 542; *Colaba*, trials, vi 590; *Colchester*, trials, ii 341; *Columbia*, channel, vi 839, vii 191, 439, xiv 693; *Columbia*, transatlantic, i 168, 361, vi 162, 306; first voyage, i 269; dimensions and data, iv 102, vi 162; *Comanche*, launch and des., viii 207; comparison of typical ocean steamers, vi 162; *Congo*, trials, vi 590; *Coralia*, dimensions, viii 426; *Corcovado*, launch, viii 865; *Cordillère*, Belleville boilers, viii 153; *County of York*, data of quadruple-expansion engines, i 79; *Craigleith*, des., xi 541; *Creole*, launch and des., viii 857; speed, ix 197; *Crescent City*, launch, ix 198; *Crown Point*, launch, xii 269; *Curacoa*, des., viii 204; *Curry*, des., v 761; *Cymric*, launch.....ix 834
Dakota, Niclausse boilers, xv 1173; launch, xvi 707; *Danube*, des. vi 634; *Denver*, launch, xiii 537; des., xiii 1138; *Deutschland*, data, xi 264; des., xii 264, xii 1125, xiii 521; record run, xii 850; vibration tests, xiii 428; record, xiii 797; dimensions, machinery, weights, data, xiii 862; machinery space, xiii 867; data, xiv 1272; *Donegal*, trials, xvi 1340; *Donnacona*, data, xiii 538; *Doris*, dimensions, machinery, weights, data, xiii 862; *Duke of Clarence*, des., iv 326; *Duke of Cornwall*, dimensions, machinery, weights, data, xiii 862; machinery space, xiii 867; des., x 925; *Duke of York*, des., vi 636, 836; *Dunolly Castle*, dimensions, ix 205; *Dunottar Castle*, des., iii 290; *Dunvegan Castle*, dimensions, viii 655; machinery.....viii 866
East Point, data, xiii 538; *Eider*, data, vi 162; *Ekaterinoslav*, launch, viii 427; *El Alba*, data, xiii 1142; speed, xiv 369; *Elbe*, bursting of copper steam pipes, iii 410; data, vi 162; *El Cid*, des., xii 262; *El Dia*, des., xiii 797; *Elizabeth Rickmers*, launch, viii 425; data, viii 654; *Ellen Rickmers*, data, viii 654; *El Norte*, launch, iv 536; *El Rio*, launch and des., iv 858; *El Siglo*, launch, xiii 798; *El Sud*, launch, iv 536; *Elton*, trials, vi 590; *Empire City*, note, ix 198; *Empress of China*, machinery data, viii 568; *Empress of India*, data, vi 162; machinery data, viii 568; *Empress of Japan*, machinery data, viii 568; *Ems*, data, vi 162; *Ernest Bazin*, des., viii 870; *Ernest Simons*, Belleville boilers, viii 153; *Ernest Woermann*, data, xii 1122; *Esperanza*, des., xiii 312; Express passenger steamers for the lakes.....v 238
Fairfax, duplicate of, vii 176; *Falls of Inversnaid*, data of quadruple-expansion engines, etc., i 80; fast ocean steamships, v 808; fast ships of various powers, 1891–1901, xiii 869; *Favorite*, des., vi 438; *Feiseen*, des., v 763; for the Minnesota S. S. Co., iv 129; *Finland*, engines, xiv 369; *Frank Rockfeller*, des., and launch, viii 425; French steamers for English Channel service, x 905; freight steamers for the American line, v 757; *Friedrich der Grosse*, data, viii 861, ix 441; speed, ix 201; *Friesland*, des., i 363; *Fuerst Bismarck*, des., iii 289,

Merchant steamers.
610; dimensions and data, iv 102; data, vi 162; *Fung-Shun*, trials, vi 590; *Furnessia*, data, vi 162; *Fusi Yama*, trials.. .....ii 340
Gallia, data, vi 162; *Gedeh*, launch and des., iv 864; *General Pel*, trials, vi 590; *George Stephenson*, launch and dimensions, viii 864; *George W. Loomis*, explosion of oil fuel, xvi 1273; *George N. Orr*, launch, viii 427; *Georgic*, des., vii 625; *German*, trials, vi 590; *Germanic*, record, vii 626; *Gigantic*, des., iv 856; *Glasgow*, trials, vi 590; *Globe*, des., vi 830; *Gloucester*, launch and des., v 758; des., v 1086; *Gothic* (new), White Star steamer, v 757; *Grand Duchess*, launch and des., viii 205; des. and trials, ix 194; *Granada*, launch, xi 1121; *Grattan, W. S.*, data, xiii 320; *Great Eastern*, dimensions and data, iv 102; data, vi 162; *Great Eastern* and *Campania* compared, v 810; Great Western Railway Co.'s new steamers, viii 868; *Grecian*, data, xii 264; *Grecian*, des., xiii 312; *Goa*, trials, vi 590; *Grosser Kurfurst*, des., xii 849; *Guelph*, des..... ..... vi 832
Hakata Maru, dimensions, ix 205; *Haliotis*, des., x 606; launch and des., x 1219; *Hardinge*, launch, xii 1123; *Harvey H. Brown*, des., vi 816; *Havel*, data, iii 288, x 283; *Haverford*, des., xiii 533, 798, xiv 695; *Hawaiian*, des., xiii 313; *Hawea*, trials, vi 590; *Heighington*, des., iv 864; *Hendrick S. Holden*, launch, x 901; *Hero*, des., vii 619; Babcock & Wilcox boilers, viii 770; *Herongate*, comparison of ordinary and Dickinson propellers, v 314; *Himalaya*, vi 410; *Hong-Kong Maru*, data, x 919; *Horatio Hall*, des..... .....x 598
Ice Crusher, Rus., x 917; *Idaho*, des., x 285; *Ignazio Floris*, des., viii 209; *Illinois*, des. and diagrams, iii 470; *Inchdune*, engines and boilers, xiii 151; *Inchkeith*, des., xi 807; *Inchmarlo*, engines and boilers, xiii 151; *Inchmona*, dimensions, viii 422; trials, viii 652; *India*, dimensions, viii 421; des., ix 201; *Indrani*, dimensions, machinery weights, data, xiii 862; machinery space, xiii 867; *Indus*, launch, ix 835; International Line's great ships, v 236; International Navigation Co's., v 522; *Iona*, compared with *Baltimore*, vi 685; marine engine trials, iii 374, iv 426; *Iris*, trials, vi 590; *Iroquois*, des., iii 146; experimental test of steam plant and review of, vi 445; *Islanda*, launch, xi 1121; *Isle of Arran*, des., v 525; *Itala*, chase of, iv 361; *Ivernia*, launch and des., xi 1119; data.....xii 577
Jamestown, des., vi 430; *James Watt*, launch, viii 865; *Jelunga*, data of quadruple-expansion engines, etc., i 78; *John Englis*, dimensions, viii 430; des., viii 872; *John Ericsson*, launch, viii 651; *John W. Gates*, coal-consumption tests, xii 895; *Juniata*, launch, ix 834; *Juno*, data, x 929; dimensions, machinery weights, data.....xiii 862
Kaiser Friedrich, note, viii 861; des., ix 826, x 911; *Kaiser Wilhelm II*, data, vi 162; launch, xiv 998; note, xiv 1270; *Kaiser Wilhelm der Grosse*, des., viii 860, x 271; pumps, ix 201; note, ix 826; record run, x 608; dimensions, machinery, weights, data, xiii 862; machinery space, xiii 867; data, xiv 1272; *Kamakura Maru*, dimensions, ix 205; *Kanagawa Maru*, dimensions, ix 205; *Kastalia*, des., ix 839; *Kasuga Maru*, data, x 918; *Kensington*, des., vi 217, 822;

Merchant steamers.
boilers, Ellis & Eaves draft, vi 748; trial, vi 830; *Kherson*, des., vii 618, vii 791, viii 639; launch, vii 852; *Kiev*, launch, viii 644; *King Edward*, turbines, xiii 799; *Kingstonian*, des., xiii 801; Kingstown and Holyhead mail service steamers, new, 1895, vii 623; *Knight Bachelor*, des., vi 839; *Konigen Luise*, data, viii 861; des., ix 828; *Korea*, des., xiii 317; des. and trials, xiv 380; *Kronprintz*, trials, vi 590; *Kronprinz Fr. Wilhelm*, data of quadruple expansion engines, i 78; *Kronprinz Wilhelm*, des., xiii 530, 1134; data, xiv 1272; *Kroonland*, engines, xiv 369; *Kumano Maru*, des.....xiii 802
La Burgogne, data, vi 162; *La Gascogne*, machinery accident, vii 139; *Lahn*, bursting of copper steam pipes, iii 410; dimensions and data, iv 102; data, vi 162; *Lake Manitoba*, des., xiii 804; Lake steamer, 1898, x 275; *La Lorraine*, des., vii 196; data, x 924, xi 1122, xiv 1272; speed, xii 848; *La Marguerite*, des., vi 636; *La Navarre*, des., vi 218; *La Normandie*, data, vi 162; *Languedoc*, alterations, old machinery to high-pressure compound, by Ashlin's system, viii 157; *La Plata*, cylindrical boilers of, compared with Belleville of *Polynésien*, viii 153; large Atlantic cargo steamers, xi 703; *La Savoie*, data, x 924, xiv 1272; des., xiii 804, 1133; *La Touraine*, des., i 362, iii 611; launch, ii 432; indicator cards, iv 134; data, vi 162; *Leinster*, note, ix 201; *Liban*, tests of Lagrafel-D'Allest boilers, v 949; *Liguria*, des. and trials, v 1075; *Loando*, sea-voyage performance, xiii 834; *Longmoon*, data, viii 655; *Louisiana*, des., vi 820; *Lubeck*, crank pin fractured, iii 456; *Lucania*, iv 856; records, (Sept., Oct., Nov., 1893), v 1019; voyage, v 1069; time of runs, etc., vi 438, 790; data, xiv 1272; *Lydens*, des., xiii 806; *Lyra*, des.....xiii 805
Machinery, space occupied by, xiii 867; *Maida*, des., x 604; *Main*, reconstruction, xiii 1140; *Maine*, des. and trials, iv 323; *Majestic*, des i 167, iii 288; *Manchester City*, launch, x 922; *Manchuria*, balance cylinders, xvi 903; *Manitou*, des., v 524; *Manola*, statement of operations, expenses, etc., season 1890, v 151; *Manora*, trials, vi 590; *Manxman*, turbine steamer, launch, xvi 1025; trials and des., xvi 1339; *Marie Henriette*, des., v 1086, vi 431; *Marie Rickmers*, data, viii 654; *Mariposa*, oil-fuel installation, xvi 788; *Mayflower* (Fall River Line), des., iv 848; Merchants' and Miners' Co's., vii 176; *Mercury*, des., vi 640; *Merkara*, trials, vi 590; Messageries Maritimes, Belleville boilers in, viii 153; *Meteor*, performance of machinery, i 227, iv 426; *Miami*, des., ix 833; *Milwaukee*, launch and des., ix 203; *Minneapolis*, data, ix 835; *Minneburg*, launch, viii 428; *Minnesota*, Niclausse boilers, xv 1163; note, xvi 1020; *Minnetonka*, des., xiv 698; *Minnewaska*, des., xiv 698; *Miowera*, des., vi 643; modern bulk oil carrier, des., x 598; *Mohawk*, launch, v 760, viii 422; *Mohegan*, launch and des., viii 422; *Monarch*, data, x 283; *Mongolia*, des. and trial, xvi 238; *Monmouth*, data, x 917; *Montezuma*, launch, xi 808; *Montfort*, launch and des., xi 542; *Moor*, changes in, vi 633; *Morro Castle*, des., xii 1118; *Morse, S. F. B.*, launch, x 902; *Mount Royal*, launch, x 1215; *Munster*, note, ix 201

Merchant steamers.
Nantucket, launch and des., xi 537; *Nebraskan*, oil burning, xvi 708; oil fuel, xvi 810; *Nemesis*, trials, vi 590; *Neptune*, des., vi 640; *Nero*, Babcock & Wilcox boilers, viii 770; *Nevadan*, launch, xiv 371; oil fuel, xvi 810; new Atlantic steamers, 1898, x 915; new Atlantic coast steamers, 1898, x 1210; new Atlantic liners, 1902, xiv 1197; *New England*, data, x 928; new Hamburg-American steamer, x 1219; *New Hampshire*, des. and trials, iv 323; new lake steamers, 1897, ix 840; new ships of the International Navigation Co., v 522; *New York*, change of flag, v 235; shaft breakage, xii 848; condenser explosion, xiii 539; (see *City of*); *Nicomedia*, data, xiii 540; *Nile*, des. and trials, v 1069; *Nippon Maru*, data, x 1224; *Noraumore*, data, xi 270, xii 1122; *Norman*, des., vi 834, vii 178; *Normania*, des., ii 237; dimensions and data, iv 102; data, vi 162; record, vi 218; *Northeastern*, data, xiii 539; North German Lloyd steamers, vii 852, viii 646, 861; contracts for, viii 207; steamer, 1900, xii 580; steamships and docks, burning of, xii 843; *Northland*, launch, vii 178; *Northtown*, data, xiii 539; *Northward*, data, xiii 539; *Northwest*, des., vi 212; machinery test, vi 430; *Northwestern*, data.....xiii 539
Oceanic, data, ix 442, xiv 1272; des., xi 262; machinery, xi 1118; of the Great Lakes, statistics, v 154; *Oglebay, E. W.*, data, viii 651; *Ohio*, repair ship, vii 72; engines, vii 619; Belleville boilers, ix 198; *Omrah*, des., x 1215; *Ophelia*, trials, vi 590; *Ophir*, des. and trials, iv 135; data, vi 162; *Oregon*, dimensions and data, iv 102; data, vi 162; *Orient*, data, vi 162; *Ormuz*, trial, compared with *Ophir*, iv 140; data, vi 162; *Oroya*, data, vi 162; *Orlégal*, Belleville boilers, viii 151; *Ortona*, launch.....xi 808
Pacific Mail steamers, 18,000 tons, xii 577; paddle steamer, machinery data, viii 568; *Pau-Tah*, trials, vi 590; *Paris*, change of flag, v 235; speed, v 755; difficulties in floating, xii 231; (see *City of*); particulars of 18, xiii 808; *Pectan*, des. and speed, vii 853; *Peleus*, des., xiii 806; *Pembroke Castle*, data, vi 162; *Pennsylvania*, dimensions, vii 851; launch, viii 862; des., ix 439, xii 1123; machinery test, xi 557; Pennsylvania R. R. ferryboat, des., x 609; *Pere Marquette*, des., xiii 313; *Persic*, data, xii 269; *Perthshire*, boilers, Ellis & Eaves draft, vi 748; *Peru*, des. and trial, v 233; *Petersburg*, des., vi 633; *Pilgrim*, Fall River Line, hull data, iv 849; *Pioneer*, engine data, v 245; Plant liner, new, des., xi 805; *Plymouth*, des., ii 587; hull data, iv 849; *Polynésien*, des., iii 289; Belleville boilers of, compared with cylindrical of *La Plata*, viii 153; *Pomona*, machinery trials, vii 436; *Ponce*, launch, xi 806; *Pontoon*, x 922; *Port Antonio*, launch and des., xiii 540; *Port Maria*, launch, xiii 542; *Pretoria*, trials, vi 590; launch, ix 834; *Prince George*, launch, x 921; *Princess Anne*, dimensions, ix 443; *Princess Clementine*, dimensions, ix 206; *Princess Maud*, turbine steamer, xvi 714; *Prinses Marie*, des., vi 840; *Prinz Heinrich*, des., vi 839, vii 437; *Prinz Regent Luitpold*, des., vii 437; *Prinzessin Victoria-Luise*, des., xiii 531; *Priscilla*, des., vi 436; *Progreso*, destruction by oil-fuel explos-

Merchant steamers.
ion, xv 272; proposed steamers for the Canadian Atlantic service, vi 642; *Puri*, des., viii 644; purchased during Spanish war, x 534; *Puritan*, hull data.....iv 849
Queen Alexandra, des., xiv 998; notes on turbine machinery, xvi 891; *Queen City*, note, viii 208; launch, viii 651; *Queen Olga*, des., combined triple and quadruple-expansion engines.....vi 596
Raglan Castle, launch, ix 443; *Ramapo*, launch and des., viii 868; *Raynhild*, trials, vi 590; Red D Line steamer, des., vii 436; *Rees, W. D.*, launch, viii 209; *Regele Carol I*, des., x 927; *Reina de los Angeles*, launch, viii 427; speed, viii 652; *Reina Maria Christina*, des., i 168; *Reindeer*, des., ix 836; *Revolution*, report on turbines, xv 1241; *Richard Peck*, des. and trial, iv 857; *Rio de Janiero*, wreck, xiii 542; *Robert Fulton*, launch, viii 864; *Robert W. Wilmot*, des., x 600; *Roebuck*, des., ix 836; *Roland*, trials, v 1077; *Rotomahana*, trials, vi 590; *Rotterdam*, dimensions, viii 208; *Runic*, launch, xii 1122; Russian ice crusher, data .....x 1222
Saale, burning of, xii 843; data, xiii 542; *Sabine*, des., xiii 315; *Sabyholin*, trials, vi 590; *Sahara*, launch, xvi 712; *St. Louis*, machinery data, vii 609; launch and des., vi 811; trials, vii 843; run of, 1896, viii 588; record 1900, xii 263; data, xiv 1272; *St. Paul*, trials, vii 843; rupture of stop valve in main steam pipe, viii 155; run of, 1896, viii 588; data, ix 835, xiv 1272; crack in steam pipe, xi 231; propeller accident, xii 1121; *St. Petersburg*, boiler weights and space, viii 642; *Samoa*, launch and des., iv 867; *Samson*, des., xiii 315; *Santiago*, des., i 363; *Savoie*, launch, xii 581; *Saxonia*, launch, xii 268; data compared with *Hyacinth* and *Minerva*, Br., xiv 460; boilers, xvi 919; *Scot*, data, vi 162; *Scindia*, trials, vi 590; *Scotia*, data, vi 162; *Scottish Hero*, des., vii 852; *Seaford*, des., vi 838; *Seguranca*, launch, ii 429; *Seine*, des., vi 635; *Senator*, launch, viii 652; des., ix 834; *Servia*, dimensions and data, iv 102; data, vi 162; *Shakspeare*, trials, vi 590; *Shawmut*, launch and des., xiv 371; *Shunlee*, trials, vi 590; *Siberia*, des., xiii 317; data, xiii 1142; *Sierra*, data, xiii 319; *Sigurd*, trial, viii 656; *Sindh*, service of boilers, iii 253; Belleville boilers, viii 153; *Sirdhana*, trials, vi 590; *Sir Henry Bessemer*, launch and des., viii 649; *Sir William Fairburn*, launch, viii 864; des., x 603; *Sir William Seimans*, launch and des., viii 649; *Sithonia*, boilers, xiv 702; *Skagul*, trials, vi 590; *Slieve Bearnagh*, des., vi 640; some recent, i 166; *Southwark*, des., v 757, vi 218; boilers, Ellis & Eaves draft, vi 748; *Spokane*, data, xiv 373; trials, xiv 999; *Spree*, des., ii 589; dimensions and data, iv 102; data, vi 162, x 283; *Star of Australia*, launch, xi 808; *Statendam*, data, x 1212; steel ships, 25 building, xi 1117; stern-wheel steamer for Argentine government, des., v 248; *Stirling Castle*, data, vi 162; *Strombus*, des., xii 266; correction of data, xii 577; *Suez*, data of quadruple-expansion engines, i 81; *Sumatra*, launch and des., vii 626; des., vii 850; *Superior City*, des., x 607; *Sylvania*, des., vii 191, 443; trial and des.....vii 843

Merchant steamers.
Tanglin, test of oil fuel, xiv 610; *Taupo*, trials, vi 590; *Tantallon Castle*, des., vii 193; *Tartar*, trials, ii 340, vi 426; *Tchihatchoff*, electric lighting, v 183; *Tekoa*, des. and trials, iv 134; *Telena*, launch, vii 853; *Tenasserin*, data of quadruple-expansion engines, i 79; *Teutonic*, des., i 167, 361; record voyage, ii 431, iv 495, 793; dimensions and data, iv 102; data, vi 162; *Texan*, balance cylinders, xvi 905; *Thames*, des., vi 635; *Tintagel Castle*, des., ix 204; transatlantic passenger steamers, xi 905; transatlantic steamers, hull and machinery data, xiv 702; transmission and distribution of power on modern ships.—Soliani, iv 173; *Trave*, broken crank shaft, v 188; trials, vi 590; *Trent*, launch, xi 1121; *Trigonia*, des., x 920; note, x 1214; *Trocas*, trial of liquid fuel, xiv 268; *Troy*, des., xi 538; *Truma*, dimensions, viii 430; *Turbinia*, turbine installation, ix 375, 571, xvi 714, 1095; cavitation of propellers, ix 678; *Turkistan*, data, xi 269; *Turret Cape*, trials.....vii 620
Ulster, des., viii 656; *Ultonia*, launch, x 916; data, xi 270; *Umbria*, trials, iii 293, vi 590; dimensions and data, iv 102; repair of shaft, v 185; data, vi 162; Union Dry Dock Co's., building, viii 208; *Unique*, des., vi 430; *Urd*, trials.....vi 590
Vaderland, des., xii 846; *Victoria*, des., ix 838; *Victorian*, turbine steamer, xvi 713; des., xvi 1337; unsatisfactory trials, xvi 1338; *Victory*, des., vii 177; trials, vii 765; *Vienna*, des., vi 834; *Vigilancia*, speed, vi 217; *Ville de Douvres*, trials, iv 409, 539; analysis of trial results, iv 539; *Ville de la Ciotat*, Belleville boilers.....viii 153
Wakatipu, trials, vi 590; *Waldo, L. C.*, des., viii 423; tests, viii 858; Ward Line steamers, x 274; *Werra*, data, vi 162; whaleback steamers, iv 453; whaleback built in England, v 762; *Winifred*, data, x 903; trials, x 982; *Wilcannia*, data, xi 808; *Winyah*, tests of retarders in Scotch boilers of.....viii 777
Yawata Maru, des., x 1223; *Yorktown*, des.....vi 430
Zeeland, data, xiii 543; *Zenith City*, des., vii 177, 621; trials, vii 765; Lang valve gear data.....xii 761
Merchant steamers: as naval auxiliaries, xiii 607; ordinary and mail, machinery weight, total, per I.H.P.....ix 692
Merchant vessels, naval requirements for.....xii 214
Mercury, Br., des.....i 265
Mercury, mer. str., des.....vi 640
Mercury for test purposes.....vi 167
Merkara, mer. str., trials.....vi 590
Merkur, Ger., turbine installation.....xv 603
Merlin, Br., data.....xiv 320
Mermaid, Br., launch, x 572; speed.....x 1195
Merrimac, data.....x 534
Merritt, Darwin R., Asst. Engr., U. S. N.—Obituary.....x 306
Merritt, James H.—Obituary.....xiv 714
Mersey, Br., des.....i 170, 264

Messageries Maritimes Company's report on Belleville and cylindrical boilers ..... viii 151
Messenger, T.—Gauging the circularity of boiler furnaces..... x 1074
Messudieh, Turk., reconstruction, xiii 1129; note..... xiv 997
Metacentric height, stability of battleships..... vi 466
Metallic: brushes for rotary converters, xii 496; packings, principles of design essential for successful development.—Longstreth, xv 404; packing, piston-rod, essential qualities, xiv 3; tubes, production by extrusion..... xi 40
Metallagraphy, X-rays in..... xi 230
Metallurgy, petroleum fuel in..... xii 1065
Metals: and alloys, effect of temperature on, ii 144; coatings immersed in sea water, durability of, x 781; delta, iii 124, 493; delta-white, antifriction, v 717; structures, failure of from fatigue, v 1026; friction and viscosity, xii 368, 927; relative corrosion of, xi 1044; Watertown Arsenal tests..... xiii 189
Metcalf, Wm.—Smoke..... iv 268
Meteor, performance of machinery, i 227; trial data..... iv 426
Meteor, Ger., launch and des., ii 236; coal-consumption and boiler data, xiv 116; (new) launch ..... xvi 704
Method of determining a continuous record of the performance of a marine engine.—Durand..... ix 1
Method of detecting adulterations in olive oil..... i 162
Method of fitting lignum vitae strips to stern and strut bearings of *Oregon* ..... xiv 260
Method of measuring the sag and lining up shafting.—Smith..... ix 726
Method of molding a cylinder in dry sand at the Bath Iron Works.—Leonard..... iv 159
Method of molding in loam and casting the cylinders for the cruisers *Cincinnati* and *Raleigh* at the Navy Yard, New York.—Kearney..... iv 376
Method of running the lines for the shafting and boring out the stern tubes and brackets for the U. S. S. *Cincinnati*.—Kearney..... v 1
Methods of testing blowing fans..... xii 157
Metric: screw threads, international standard for, xi 206; system, weights and measures, xi 467; progress of in the United States.. ..... xii 469
Mexico, ship building, 1901..... xiii 1120
Meyer, John H. F.—Translation, the investigation of the stresses on the frames of vertical, inverted steam engines, xv 19; investigation of the stresses on frames of vertical steam engines as modified for marine engines..... xv 971
Miami, mer. str., des..... ix 833
Miantonomoh, authorization and data, i 236; reconstructed monitor, ix 528; European cruise, 1866, ix 528; steaming radius..... xiii 60
Mickley, Joseph Philip, Comdr., U. S. N.—Obituary..... xiv 712
Micro-examination of metals and crystallography..... x 967
Mikasa, Jap., des..... xii 1110, xiv 344
Milan, Fr., defects in..... iv 315
Mile, measured, for progressive trials, iv 600; Newport, R. I., survey of..iv 608

Military importance of naval engineering experiments.—Melville.....xv 512
Miller marine cableway.....xiii 35
Milligan, R. W., Chief Engr., U. S. N.—Discussion, experimental station and engineer school.....vii 475
Mills, electric transmission in.....xii 402
Milton, F.—Discussion, induced draft and hot air, combined, in boilers fitted with "Serve" tubes and retarders.....v 841
Milton, J. T., Chief Engr., surveyor, Lloyd's Register.—Discussion, marine boiler furnaces, v 413; on the present position of water-tube boilers as applied for marine purposes, v 931; reply to discussion, v 959; water-tube boilers, vi 357; remarks on steam pipes, vii 522; discussion, Yarrow's feed-water heater.....x 417
Milwaukee, data, xii 822; characteristics, xii 1086; bids on, xiii 471; launch and des.....xvi 1310
Milwaukee, mer. str., launch and des.....ix 203
Miner, L. D., Asst. Engr., U. S. N.—The contract trial of the U. S. S. *Newark*.....iii 99
Mineral rubber dip for iron water pipes.....xi 942
Minerva, Br., note, vii 815; trials, viii 832, xi 324, xii 563, xiii 489, 698, 1004; comparative tests, xii 251; boilers, xii 711, xvi 919; boiler tests, xiii 281; data compared with *Hyacinth*, Br., and *Saxonia*, mer. str., xiv 460; Delauney-Belleville, comment on report of trials.....xiv 905
Minerva, class, Br., characteristics.....viii 560
Minerva and *Hyacinth*, Br., trials, 2d report, xiv 458, 473-4; trials, xiv 638; boiler discussion.....xvi 515
Mines, hoisting machines for.....xi 1074
Minima and maxima curves, non-algebraic, treatment of by use of ordinates.....iv 71
Ministro Zentano, Chili, launch, viii 385; note.....ix 143
Minneapolis, cruiser *No. 13*, des., iii 258, iv 735; bids, iii 459; data, vi 652; triple screws, iv 290; launch, v 721; air-pump data, vi 532; official trial, vi 598; contract trial, vi 702; steam consumption of main and auxiliary machinery, x 1; comments on triple screws, xi 641; data, compared with protected cruisers, xii 1015; steaming radius.....xiii 62
Minneapolis, mer. str., data.....ix 835
Minneburg, mer. str., launch.....viii 428
Minnesota, completion of.....xvi 1020
Minnesota, mer. str., Niclausse boilers.....xv 1103
Minnesota S. S. Co., freight steamers for.....iv 129
Minnetonka, mer. str., des.....xiv 698
Minnewaska, mer. str., des.....xiv 698
Minotaur class, Br., compared to *Black Prince* and *Achilles* classes, xvi 1278. *Defense*, *Orion* and *Shannon*, Br., bids on.....xvi 1323
Miowera, mer. str., des.....vi 643
Miscellaneous items, coal, etc., lectures before Naval War College.—Hollis.....iv 740
Mishaps during the maneuvers of the British Navy, 1892.....iv 837

Missiones, Arg. Rep., des., viii 383; speed.....viii 805
Mississippi, 13,000-ton battleship, chief characteristics, xvi 36; bids on, 37; comparison with *Kearsarge* and *Alabama*, 38; contracts awarded, 37; weights 39
Missouri, act of Congress, x 798; des., x 1163; boilers, xi 232; launch and des., xiv 301; des. and contract trial.....xv 1185
Mistral, Fr., launch, xiii 782; trials.....xiii 1095
Mitis metal.....iii 501
Mittielungen aus dem Gebeite des Seewesens, translation from, on rotation of propellers.....xvi 119
Miyabara water-tube boiler.....x 1146
Mobilization, quick, of a squadron.....xii 802
Moccasin, name, xii 825; data, xiii 476; launch, xiii 767; contract trials, xv 39
Mode, Swed., launch, xiv 996; trial.....xiv 1266
Model comparisons for calculating power for marine propulsion.....viii 310
Model experiments.—White.....xvi 306
Modern: bulk oil carrier, des, x 598; cranes.—Warren, v 921, vi 147; cupola practice.—Summers, x 1045; marine engines, boilers, etc., lectures before Naval War College.—McFarland, vi 647; ships, transmission and distribution of power on, iv 173; steamers, longevity and service of.....v 1029
Modoc, auxiliary navy; x 536; data.....x 824
Moen, Dan., wreck of.....xiii 1082
Mohawk, *Br.*, des.....i 265, 171
Mohawk, auxiliary navy, x 537; data.....x 824
Mohawk, mer. str., launch.....v 760, viii 422
Mohawk, U. S. R. C., launch.....xiv 616
Mohegan, mer. str., des. and launch.....viii 422
Moist steam, application of entropy diagram to.....x 339
Moisture in coal, allowance for in boiler testing.....x 133
Moldenke, Dr. R.—The melting point of cast iron.....x 1009
Molding and casting steel.....xv 130
Molding cylinder in dry sand, Bath Iron Works.....iv 159
Molding cylinders in loam and casting, *Cincinnati* and *Raleigh*.....iv 376
Molybdenum and tungsten steels.....xii 228
Monadnock, authorization and data, i 236; speed curves, iii 556; work on, iv 292; reconstructed monitor, ix 528; voyage Philadelphia to San Francisco, ix 528; steaming radius.....xiii 62
Monarch, Br., des., i 264; remodeled.....vi 800
Monarch, Aus., des., vii 417; trials.....x 222
Monarch, mer. str., data.....x 283
Mongolia, mer. str., des. and trial.....xvi 238
Monitor, The, and the Navy Under Steam.—Bennett, book received..xii 1132
Monitors: American, reconstructed, ix 525; *Arkansas*, *Florida*, *Nevada* and *Wyoming*, boiler weights compared, xv 576; experiences in engine rooms of *Amphitrite*, ix 530; sea voyages of *Miantonomoh*, *Monadnock*, *Amphitrite*, ix 529; temperatures at sea, hatches closed..ix 533

Monmouth, Br., launch and des., xiv 318; projected trials, xiv 1248; trials, xvi 258; propellers, changes in.....xvi 261
Monmouth class, Br., machinery space.....xiii 867
Monmouth, mer. str., race with yacht *Sovereign*, viii 873; data.....x 917
Monsoon, yacht, trial.....vii 629
Montagu, Br., launch, xiii 487; trials.....xiv 1249, xvi 260
Montana, des.....xvi 1255
Montcalm, Fr., des., x 870; data, xi 252; launch and des., xii 568; des., xiii 290; trials, xiii 1091, xiv 329; compared to *Prinz Heinrich*, Ger., xiv 334; speed, xiv 669; Normand-Sigaudy boilers.....xiv 968
Monterey, coast-defense vessel, i 176; authorization and data, i 236; boiler data, ii 414; speed curves, iii 556; work on, iv 292; boiler weights, iv 703, vi 662; des. and contract trials, v 115; air-pump data, vi 532; steaming radius.....xiii 62
Montezuma, mer. str., launch.....xi 808
Montfort, mer. str., launch and des.....xi 542
Montgomery, cruiser *No. 9*, des. and bids, i 253, 350; launch, iv 117; work on, iv 294; grounding, v 1034; trial, vi 175; air-pump data, vi 532; breakage of crank pin, vi 602; steaming radius.....xiii 62
Montupet water-tube boiler.....xiv 279
Moor, mer. str., changes in.....vi 633
Moorhen, Br., launch.....xiii 1112
Morant, Admiral R. N.—Discussion, torpedo-boat destroyers.....xiv 408
Morcom, Alfred.—High-speed self-lubricating steam engines.....ix 689
Moreno (*Nisshin*), Jap., purchase and des.....xvi 364
Morgan, Leo.—Alignment of shafting and boring out stern tubes, as practiced at Union Iron Works, v 7; contract trial of the United States coast-line battleship *Oregon*, viii 439; contract trials of torpedo-boat destroyers, *Paul Jones*, *Perry* and *Preble*, xiv 773; destruction of the steamship *Progreso*, xv 272; official trials of the submarine boats *Grampus* and *Pike*.....xv 584
Morison, D. B.—Marine boiler furnaces, v 11; reply to discussion, v 420; experiments in connection with evaporation.....vii 486
Morison Suspension Furnaces, book received.....x 619
Morison evaporators.....vii 492
Moritz, Albert, Lt. Comdr., U. S. N.—Contractor's full-power forced-draft trial of the U. S. S. *Bennington*, iii 206; freshly-hewn or green wood as fuel, xii 100; discussion, organization of the engineer's division on board a man-of-war, xiii 941; contract speed trial of the U. S. torpedo boat *Wilkes*, xiv 856; contract speed trial of U. S. torpedo boat destroyer *Stewart*, xv 111; official trial of the U. S. S. *Florida*, xv 546; hints on the inspection of steel.....xv 609
Morley, A. W., Chief Engr., U. S. N.—The contract trial of the U. S. armored cruiser *Maine*, vii 1; obituary.....xv 604
Morrill, data.....x 534
Morris, torpedo boat *No. 14*, des. and trials, x 502; launch, x 533; full data.....x 818, xiii 1082
Morro Castle, mer. str., des.....xii 1118

Morse, Fr., data.....xii 568, xiii 291
Morse, S. F. B., mer. str., launch.....x 902
Mosher boilers: *Nicholson*, *O'Brien*, *Rodgers*, *Rowan*, *Winslow*, xiii 1082; *Foote*, ix 662, xiii 1082; compared with others, xiv 424; *Florida*, xv 563, 564; weights compared with other monitors, xv 576; new, for *Tarantula*, yacht.....xvi 1341
Moskva, Rus., launch and des.....x 895
Motive power: of small vessels, v 882; of warships, logical arrangement, xi 641
Motors: and generators for electric-power transmission, xiv 817, 1109; Bánki, xii 1067; Diesel, x 162; test, xi 73; thermal efficiency, xi 396; electric, direct-geared, dangers of, xi 229; for driving tools, vi 552; for electric-power transmission, xiv 821, 1109; for small vessels, steam, naphtha, petroleum, electric and gas, v 882; Keeley, post-mortem revelations, xi 207; relative weight and power of electric, compressed-air, and oil, vi 582; self-starting, single-phase, xi 1076; petroleum, xi 1066; small, measuring the speed of, xi 459; synchronous, for electric transmission.....xii 415
Mount Royal, mer. str., launch.....x 1215
Mousquetaire, Fr., des.....iii 604
Mousqueton, Fr., trials.....xvi 349
Moving body in water, effect on.—Isherwood.....i 97
Mudd evaporators, vii 492; engines, superheater and feed-heater, *Inchmona*, viii 653; tail shaft preserver.....v 712
Mueller, Otto H.—The accident to the *City of Paris*.....vi 290
Multiple-cylinder engines, reheaters for.....xii 385
Multiple-expansion engines, indicator diagrams.....xi 46
München-Lubeck, Ger., launch.....xvi 1017
Munster, mer. str., note.....ix 201
Muntz metal for condenser tubes.....xv 202
Murakumo, Jap., data.....xi 260
Mutine, Br., boiler explosion, xiii 281; data, xiii 489; trials, xiv 206; speed.....xiv 320
Muzzle velocity, 6-inch gun.....xi 504
Myrtle, yacht, data of quadruple-expansion engines.....i 80
Myrmidon, Br., speed, xiii 491; trials.....xiv 208

N

N, second-class cruiser, Ger., triple screws, viii 551; note, viii 631; boilers.....ix 815
Nagasaki, shipbuilding at.....xi 190
Naiad, Br., launch, iii 131; performance data.....iii 597
Naiade, Fr., data.....xiii 781
Names, of ships, 1890–91, iii 126; of new vessels, 1904.....xvi 994
Namouna, yacht, des. of new machinery, trials.....v 1084, vi 440
Nanaimo coals, notes on.....i 72
Nanshan, data.....x 534
Nantucket, mer. str., launch and des.....xi 537

Naphtha motors for small vessels.....v 886
Naphtha yacht, des.....viii 216
Napoli, It., des.....xvi 363
Narcissus, Br., des.....i 265
Narval, Fr., data.....xiii 291
Nashville, gunboat *No. 7*, bids, v 1037; des., v 722, vi 176; arrangement of machinery for low power, vi 597; launch, vii 804; evaporators, test of, viii 95; des. and contract trial, ix 574; notes on trial, ix 791; steaming radius.....xiii 62
Natter, Aus., note, viii 385; trials.....viii 806
Naumann, W. H., Comdr., U. S. N.—*Denver*, general description, official trial.....xvi 67
Navahoe, yacht, des.....v 650
Naval: Academy practice vessel, bids, ii 408; appropriation bill, 1902, xiv 933; Architects and Marine Engineers, annual meeting, 1900, xii 1039; 1904, program, xvi 1306; Architects, British, Institute of, program, xvi 641; architecture, advance in mathematical theory of, etc., ix 730; manuel of, vi 443; auxiliaries, merchant steamers for, xiii 607; base and coaling station at Guam, xii 526; boilers, iv 273; Boilers, text-book.—Bieg, xvi 379; boiler problem.—Halligan, xv 207; boiler question in France, xv 449; boilers, report of Admiralty committee on British, xvi 918; brass, xv 200; Construction and Armaments Co., Barrow-in-Furness, apparatus for testing ships' models viii 788; British cruisers building by, viii 557; galvanizing and electrolytic plant, viii 792; machinery data of vessels, viii 568; construction, German, excellence of, xv 513; construction, laws of similitude, vii 284; defence Act, 1889, Br., ships provided, iii 261; Engines and Machinery, text-book.—Barton, xvi 1345; engineers, education of, for future needs, xv 850; engineer officers and the "Problem," viii 21; engineering experiments, importance of, xv 512; engineering laboratory, scope and purpose, xv 512; estimates, 1904-05, England, xvi 336; force, German, iii 466; machinery, table showing progress in, vi 652; maneuvers, British, 1888, i 169; 1892, iv 786, mishaps in, iv 837; France, 1891, iii 599; militia, necessity of engineer divisions in, viii 303; officers, British Admiralty scheme for training, xv 144; officers, education and training of, xv 902; Pocketbook, Clowe's, book received, xvi 1026; program, 1903, xiv 613; British, the Admiralty and the, xvi 1266; 1892, French, iv 843; program proposed by the General Board, xvi 1313; repair ships, *Vulcan*, xiv 1031; requirements for American-built merchant vessels, xii 214; station, Cavite, P. I., xi 721; strength, speed in construction a vital factor in x 150
Naval Vessels, United States.
Abarenda, auxiliary navy, x 535; data, x 824; *Accomac*, auxiliary navy, x 535; data, x 824; *Active*, auxiliary navy, x 535; data, x 824; *Adder*, name, xii 825; data, xiii 476; launch, xiii 767; contract trials, xv 39; *Agamenticus* see *Terror; Aileen*, auxiliary navy, x 535; data, x 824; *Alabama*, bids and engines, viii 797; launch, x 533; battery compared to *Canopus*, x 786; preliminary trials, xi 1087; trials, xii 825; contract trials, xiii 855; notes on machinery, xiv 1; progressive

Naval Vessels, United States.
trials, xiv 181; *Albany*, data, x 534; des., xi 513; note, xi 780; stability of, xi 1045; trials, xii 236; contract trial, xii 281; steaming radius, xiii 54; coal consumption, xv 366, 379; *Albatross*, coals of Pacific coast, results of, on cruise of, i 69; des., vi 497; *Albatross*, auxiliary navy, x 535; data, x 824; *Alert*, test of a Babcock & Wilcox boiler, xi 285; *Alexander*, data, x 824; *Algonquin*, data, x 534; des., x 828; *Alice*, data, x 534; *Alliance*, propellers, notes on action of, i 125; alphabetical list of, U. S. Navy, xi 1090; *Amphitrite*, reconstructed monitor, ix 528; experiences in engine rooms, ix 530; hydraulic system compared with *Terror's* pneumatic system, ix 542; steaming radius, xiii 54; *Annapolis*, gunboat *No. 13*, vii 581, 804; named, viii 799; launch, ix 140; data, ix 401; des. and contract trials, ix 560; steaming radius, xiii 54; appropriations 1904, xvi 334; *Arethusa*, steaming radius, xiii 54; *Arctic*, data, x 824; *Arkansas*, act of Congress, x 813; bids, x 1169; launch, xii 1094; trial, xiv 946; des. and contract trials, xiv 1172; comparison of monitor performances, xv 823; *Armeria*, data, x 534; armored cruiser *No. 2*, des., ii 231; bids, ii 407; armored cruisers, *Nos. 4* to *9*, bids opened, xiii 224; *Atlanta*, des., i 236, 249; delayed trials, i 253; trials, measured mile, i 353; propeller data, iv 158, 402; coal endurance, iv 669; ice machine, iv 775; air pump data, vi 532; data, xii 237; steaming radius, xiii 54; authorization and data of 1882 to 1889, i 236; auxiliary vessels, prices paid for.....x 1161
Bache, launch, xiii 1085; *Badger*, auxiliary navy, x 535; data, x 824; *Bagley*, named, x 818; full data, xiii 1082; des. and contract trial, xiii 651; *Bailey*, data, x 818; des., xiii 768; full data, xiii 1082; trials, xiii 472; *Bainbridge*, named, x 817; launch, xiii 769; full data, xiii 1082; data, xiii 1085; failure of forced-draft blowers, xiv 296; contract and standardization trial, xiv 1003; *Baltimore*, vi 685; des., i 236; preliminary trials, i 250; des. and contract trial, i 337; second trials, ii 122; boiler data, iii 422; trials, iii 582; engine data, iii 422; deterioration of condenser tubes, iv 114; propeller data, iv 158, 402; coal endurance, iv 663; air-pump data, vi 532; steaming radius, xiii, 54; *Bancroft*, practice vessel, ii 408; des., i 352; launch, iv 295; trials, v 204; contract trial, v 365; analysis of progressive trial, vi 265; air-pump data, vi 532; steaming radius, xiii 54; run of, transatlantic, ix 126; *Barney*, named, x 818; trials, xiii 240; speed, xiii 472; des. and contract trial, xiii 651; full data, xiii 1082; *Barry*, named, x 817; full data, xiii 1082; launch, xiv 613; contract and standardization trial, xiv 1003; battleships, 1890, bids, ii 575; battleships and torpedo boats, new, 1896, viii 596; battleships, new, 1901, designs for, xiii 734, battle ships *Nos. 5* and *6*, *Kearsarge* and *Kentucky*, des., vii 581, 801; battleships *Nos. 13* to *17*, *Virginia*, *Nebraska*, *Georgia*, *New Jersey*, *Rhode Island*, bids opened, xiii 224; battleships, progressive trials, *Massachusetts*, *Alabama*, *Kearsarge*, xiv 181; *Bennington*, des., i 243; test of evaporators, i 291; work on, ii 417; des. and trials, iii 206; power of auxiliary machinery, iii 217;

Naval Vessels, United States.
coal consumption, iv 110; propeller data, iv 158, 402; coal endurance, iv 662; air-pump data, vi 532; steaming radius, xiii 54; *Bennington* and class, coal consumption, xv 366, 379; *Biddle*, named, x 818; des. and contract trial, xiii 651; full data, xiii 1082; *Blakely*, named, x 818; launch, xiii 240; full data, xiii 1082; trials, xvi 995; contract trials, xvi 1076; *Boston*, des., i 236, 249; trials interrupted, i 252; trials, measured mile, i 354; boiler and engine data, iii 422; trials, iii 582; propeller data, iv 158, 402; coal endurance, iv 668; air-pump data, vi 532; steaming radius, xiii 54; *Brooklyn*, des., iv 805; bids, v 201; high smoke pipes for, vi 669; launch, vii 804; contract trials, viii 741; list of engines and steam cylinders, viii 761; trials, ix 400; steaming radius, xiii 54; *Brown, W. H.*, auxiliary navy, x 535; data, x 824; *Brutus*, data, x 824; *Buffalo*, data, x 534; steaming radius..... .....xiii 56
Caesar, auxiliary navy, x 535; data, x 824; *California*, characteristics, xii 810; compared to *King Alfred*, Br., xiv 314; launch and des., xvi 678; *Calumet*, data, x 534; *Cassius*, data, x 824; steaming radius, xiii 56; *Castine*, gunboat *No. 6*, ii 206; des., i 351; launch, iv 294; des. and contract trials, v 846; alterations in, vi 176; air-pump data, vi 532; run from South America, ix 125; steaming radius, xiii 56; *Celtic*, data, x 824; steaming radius, xiii 56; *Charleston*, data, xii 822; characteristics, xii 1086; launch, xvi 333; *Charleston*, old, date of trial, i 83; des., i 237; preliminary trials, i 250; test of evaporators, i 291; des. and contract trial, i 310; Marshall valve gear, ii 3; engine vibrations, iii 16; power of auxiliary machinery, iii 217; boiler data, iii 422; trials, iii 582; engine data, iii 422; propeller data, iv 158, 402; chase of the *Itata*, machinery defects developed, iv 361; coal endurance, iv 340, 639; coal expenditure, iv 683, v 70; boiler weights, iv 703; air-pump data, vi 532; failure of steel piston, vii 789; wreck of, xi 1085, xii 203; *Chattanooga*, data, xi 508, 1081; *Chauncey*, named, x 818; full data, xiii 1082; launch, xiii 1085; contract and standardization trial, xiv 1003; *Chesapeake*, practice vessel, i 352; *Chicago*, des., i 236, 249; trials, measured mile, i 354; engine and boiler data, iii 422; trials, iii 582; propeller data, iv 158, 402; coal endurance, iv 667; air-pump data, vi 533; repairs to, viii 383; steaming radius, xiii 56; inertia stresses of valve gear, xii 913; *Chickasaw*, data, x 824; *Choctaw*, auxiliary navy, x 535; data, x 824; *Cincinnati*, ii 416; des., i 349; work on, iv 293; cylinders, molding in loam and casting, iv 376; launch and des., iv 817; running lines for shafting and boring out stern tubes and bearings, v 1; machinery accident, xi 214; test of Babcock & Wilcox boilers, xii 882; steaming radius, xiii 56; boiler test, xiii 223; speed curve, iii 556; *Cleveland*, data, xi 508, 1081; launch, xiii 1083; des. and contract trial, xv 1110; coal-consumption and speed curves, xv 366; *Coaler*, auxiliary navy, x 535; coast-defense vessel *Monterey*, i 176; *Colorado*, characteristics, xii 810; trials, xvi 996; des. and contract trial, xvi 1118; *Columbia*, cruiser *No. 12*, ii 576, vii 569; des., ii 409; triple screws, iv 290; launch and des., iv 513; boiler weights, iv 703; trials, v 1034; des. and

Naval Vessels, United States.
trials, vi 1; total number steam engines and cylinders, vi 33; air pump data, vi 532; run of, Southampton to New York, vii 567, xii 736; comments on triple screws, xi 641; steaming radius, xiii 56; compared with *Good Hope*, Br., xv 266; comparisons of propellers, iv 400; *Concord*, test of evaporators, i 29; des., i 243; work on, ii 417; trial, ii 578; des. and trial, iii 89; power of auxiliary machinery, iii 217; bursting of main steam pipe, iii 399; boiler data, iii 422; trials, iii 582; engine data, iii 422; coal consumption, iv 110; propeller data, iv 158, 402; coal endurance, iv 661; boiler weights, iv 703; air-pump data, vi 532; valve-chest repairs, vi 761; steaming radius, xiii 56; *Connecticut*, Act of Congress, x 813; bids, x 1169, xiv 1233; des., xiv 935; launch and des., xvi 1308; *Corwin*, data, x 534; *Craven*, full data, x 818, xiii 1082; speed, xii 241; *Craven* and *Dahlgren* in collision; xii 1097; cruiser *No. 6*, des., ii 230; bids, ii 408; work on, iv 293; cruisers, *Nos. 7* and *8*, *Cincinnati* and *Raleigh*, 3,000-ton, des., i 349; machinery for, ii 416; cruisers, *Nos. 9*, *10*, *11*, *Montgomery*, *Detroit*, *Marblehead*, 2,000 tons, authorization and data, i 253; des. and bids, i 350; cruisers, *Nos. 9* and *10*, work on, ii 417; cruiser *No. 10* named *Detroit*, iii 595; cruiser *No. 11*, work on, ii 417, iv 294; cruiser *No. 12*, work on, iv 294; cruisers *Nos. 12* and *13*, *Columbia* and *Minneapolis*, triple screws, iv 290; cruiser *No. 13*, bids, iii 459; work on, iv 294; cruisers *Nos. 14* to *19*, dimensions, xi 779; *Culgoa*, steaming radius, xiii 56; *Cushing*, launch and des., ii 127; machinery, ii 215; trial, Thornycroft boiler, ii 580; trials, iii 459; experiments and investigation, des. and trials, iv 1; des. and contract trials, iv 43; propeller data, iv 158, 402; boiler weights, iv 703; engine vibrations, iii 16; compared with *Ericsson*, vii 572; data, x 818; steaming radius, xiii, 56; full data.....xiii 1082
Dahlgren, data, x 818; launch and des., xi 781; trial, xi 1083; full data, xiii 1082; *Dahlgren* and *Craven* in collision, xii 1097; *Dale*, named, x 818; launch, xii 822; full data, xiii 1082; note, xiv 614; trials, xiv 947; *Davis*, data, x 818; boiler accident, x 1175; trials, xi 237, 892; full data, xiii 1082; *Decatur*, named, x 818; full data, xiii 1082; contract trial, xiv 57; *De Long*, named, x 818, full data, xiii 240, 1082; contract and standardization trials, xiv 825; *Denver*, data, xi 508, 1081, xiv 357; launch, xiv 947; general description, official trial, xvi 67; second official trial, xvi 612; *Des Moines*, data, xi 508, 1081; launch and des., xiv 1233; general description, official trial, xvi 222, 227; destroyers *Nos. 1* to *16*, named, x 817; bids for, x 1173; contractor's request for increased price, xiv 295; *Detroit*, cruiser *No. 10*, i 253; des. and bids, i 350; launch, iii 595, iv 117; work on, iv 293; trial, v 500; air-pump data, vi 532; steaming radius, xiii 56, 58; *Detroit* and class, coal consumption, xv 366, 379; *Dixie*, data, x 534; steaming radius, xiii 58; coal consumption, xv 366, 379; *Dolphin*, boiler and engine data, iii 422; trials, iii 582; propeller data, iv 158, 402; efficiency of coke, vi 736; air-pump data, vi 532; practical test, George's Creek Cumberland coal, vii 329; steam-consumption tests, x 74; steam-

Naval Vessels, United States.
ing radius, xiii 58; *Dorothea*, auxiliary navy, x 536; data, x 824; *Dubuque*, launch, xvi 995; *Dupont*, launch, ix 401; repairs, x 221; full data, x 818, xiii 1082; steaming radius.....xiii 58
Eagle, data, x 534; *East Boston*, data, x 824; *Elfrida*, data, x 824; *Enquirer*, data, x 824; *Enterprise*, turnabout launch, ii 222; *Ericsson*, launch, vi 421; trials, vi 793; accident to, vii 572; full data, x 818, xiii 1082; steaming radius.....xiii 58
Farragut, data, x 818, xiii 1082; launch, x 827; speed, x 1174; trials, xi 232, 892; *Fish Hawk*, auxiliary navy, x 536; data, x 824; *Florida*, Act of Congress, x 813; bids, x 1169; launch, xiv 297; contract trial, xv 546; comparison of monitor performances, xv 823; *Foote*, des. and contract trials, ix 655; repairs, x 220; data, x 818; steaming radius, xiii 58; full data, xiii 1082; *Fox*, data, x 818; trials, xi 892; full data, xiii 1082; *Free Lance*, auxiliary navy, x 536; data, x 824; *Frolic*, data, x 824; *Fulton* (old), her design, construction and capacity, x 422; *Fulton*, test, xiv 298; gasoline explosion, xiv 614; launch.....xiii 767
Galveston, data, xi 508, 1081; *Gedney*, auxiliary navy, x 536; data, x 824; Generals Boards' proposals, xvi 1313; *Georgia*, data, xii 235, 529; *Glacier*, data, x 824; steaming radius, xiii 58; *Gloucester*, auxiliary navy, x 535; data, x 824; steaming radius, xiii 58; *Golden Gate*, launch, ix 403; *Goldsborough*, data, x 818; trials, xiii 473; repairs, xiii 769; full data, xiii 1082; machinery accident, xiv 1235; trials and accidents, xv 778; *Governor Russell*, data, x 824; *Grampus*, launch, xiv 947; name, xii 825; des., contract and standardization trial, xv 584; *Grant*, data, x 534; *Gresham*, auxiliary navy, x 536; data, x 824; Gunboats, *Nos. 5* and *6*, 1,000-ton, *Newport* and *Princeton*, des., i 351; bids, ii 408; gunboat *No. 7*, des., v 722; gunboats *Nos. 7*, *8* and *9*, bids, v 1037; contracts given, vi 176; gunboats, *Nos. 8* and *9*, des., v 727; gunboats, *Nos. 10*, *11*, *12* and *13*, des., vii 581; bids, vii 804; gunboats, *Nos. 14* and *15*, des., vii 583; *Guthrie*, data, x 534; *Gwin*, launch, x 533; des. and trials, x 493; data, x 818; steaming radius, xiii 58; full data.....xiii 1082
Hamilton, data, x 534; *Hannibal*, data, x 824; steaming radius, xiii 58; harbor-defence ram, *Katahdin*, des., ii 576; work on, iv 295; *Hartford*, dock trials, xii 237; *Harvard*, auxiliary navy, x 536; data x 824; *Hawk*, data, x 534; *Hector*, data, x 824; *Helena*, v 727, 1037, vi 176; launch, viii 160; contract trials, ix 360; broken propeller shaft, xi 900; steaming radius, xiii 58; *Hercules*, auxiliary navy, x 536; data, x 824; *Hesperia*, auxiliary navy, x 536; *Hist*, auxiliary navy, x 536; data, x 824; steaming radius, xiii 58; *Holland*, purchase, xii 556; trials, xi 1089, xiii 243; Holland submarines, *Nos. 3* to *8*, gasoline engines for, xiii 144; *Hopkins*, named, x 818; full data, xiii 1082; launch, xiv 616; des. and contract trials, xv 694; *Hornet*, data, x 534; steaming radius, xiii 60; *Hortense*, auxiliary navy, x 536; data, x 824; *Hudson*, data, x 534; *Hull*, named, x 818; full data, xiii 1082; launch, xiv 947; des. and contract trials, xv 694; *Huntress*, data, x 824; *Huntress*, second, data.....x 824

Naval Vessels, United States.
Illinois, viii 596; bids and engines, viii 797; launch, x 1174; preliminary trial, xiii 472; contract trials, xiii 559; station bill, analysis, xiii 582; docking in floating drydock, xv 14; *Inca*, data, x 824; *Indiana*, ii 575, des., ii 409; work on, iv 292; launch and des., v 492; trial, vi 421; des. and contract trial, vii 637; engines and steam cylinders, vii 662; coal economy and blockade duty, x 1044; steaming radius, xiii 60; coal consumption, xv 366, 379; *Iowa*, des., iv 811; bids, v 202; launch, viii 383; trials, ix 400, x 220; des. and contract trials, ix 453; list of engines and steam cylinders, ix 478; rapid coaling of, xii 222; steaming radius, xiii 60; coal consumption, xv 366, 379; *Iris*, auxiliary navy, x 537; data, x 824; test of evaporating plant, xi 889; steaming radius, xiii 60; *Iroquois*, auxiliary navy, x 537; data, x 824; *Isla de Cuba*, data, xii 553; *Isla de Cuba*, *Isla de Luzon*, *Don Juan de Austria*, ice machines, xiv 525; *Isla de Luzon*, data.....xii 553
Jones, *J. D.*, data, x 824; *Justin*, auxiliary navy, x 537; data, x 824; steaming radius.....xiii 60
Kanawha, data, x 824; *Kansas*, balance cylinders, xvi 905; *Katahdin*, ii 576, iii 126, iv 295; launch and des., v 202; speed, vii 804; des. and contract trials, viii 1; inertia stresses of valve gears, xii 920; steaming radius, xiii 60; *Kearsarge*, battleship *No. 5*, vii 581, 801; bids, viii 160; launch, x 529; note, xi 781; contract trial, xi 823; trial, xii 548; commissioned, xii 236; notes on machinery, xiv 1; progressive trials, xiv 181; coal consumption, xv 366, 379; *Kentucky*, battleship *No. 6*, vii 581, 801; bids, viii 160; launch, x 529; note, xi 781; trial, xi 1082, xii 823, xiv 298; contract trial, xii 1; list of auxiliary machinery, xii 20; coal consumption.....xv 366, 379
Lawrence, named, x 818; launch, xii 1096; full data, xiii 1082; des. and contract trial, xv 667; *Lebanon*, data, x 534; *Leonidas*, data, x 824; lighter *No. Eighteen*, auxiliary navy, x 536; data, x 824; loaned to States for naval militia, xii 241; *Louisiana*, des. xiv 935; bids, xiv 1233; launch.....xvi 996
Macdonough, named, x 818; launch and des., xiii 255; full data, xiii 1082; des. and contract trial, xv 667; *Machias*, gunboat *No. 5*, i 351, ii 206; launch, iv 117; work on, iv 294; trials, v 720; des. and contract trials, v 846; alterations in, vi 176; air-pump data, vi 532; steaming radius, xiii 60; *Mackensie*, launch, x 533; data, x 818; speed, x 827; trials, xi 234, 892; full data, xiii 1082; *Maine*, Act of Congress, x 798; des., x 1163; launch, xiii 770; builders' trial, xiv 948; des. and contract trials, xiv 1123; boiler report, Niclausse, xv 951; progressive trial, xvi 526; *Maine* (old), des., i 175, 239; work on, ii 411; launch, ii 577; speed curves, iii 556; work on, iv 291; dock trial, v 719; official trial, vi 792; des. and contract trial, vii 1; engines and cylinders, number of, vii 28; explosion, x 221; court of inquiry, x 529; *Mangrove*, data, x 534; *Manila*, steaming radius, xiii 60; *Manly*, data, x 534, xiii 1082; *Manning*, U. S. R. C., launch, ix 140; des. and contract trial, ix 711; data, x 534; *Maple*,

Naval Vessels, United States.
data, x 534; *Marblehead*, cruiser *No. 11*, i 253, iv 294; des. and bids, i 350; launch, iv 516; des. and contract trials, vi 129; air-pump data, vi 532; steaming radius, xiii 60; *Marcellus*, data, x 824; towed, coaling *Massachusetts*, xiii 35; *Marietta*, gunboat *No. 15*, bids and contract, vii 804; des., vii 583; named, viii 799; launch, ix 401; des. and contract trial, progressive, ix 641; performance, x 221; steaming data, x 826; steaming radius, xiii 60; performance of Babcock & Wilcox boilers, xv 59; Babcock & Wilcox boilers, xvi 1223; *Maryland*, characteristics, xii 810; dock trials, xvi 996; *Massachusetts*, authorization and des., ii 409; changes and bids, ii 575; work on, iv 292; launch, v 721; dock trials, vi 602; des. and contract trials, viii 237; engines and cylinders, steam, list of, viii 265; coal economy on blockade duty, x 1044; coaling from *Marcellus* in tow, xiii 35; steaming radius, xiii 60; progressive trials, xiv 181; coal consumption, xv 366, 379; *Massassoit*, data, x 824; *Mayflower*, data, x 534; steaming radius, xiii 60; *McArthur*, auxiliary navy, x 537; data, x 824; *McCulloch*, U. S. R. C., launch, ix 140; des. and contract trials, ix 711; data, x 534; *McKee*, full data, x 818, xiii 1082; *McLane*, auxiliary navy, x 537; data, x 824; *Merrimac*, data, x 534; *Miantonomoh*, reconstructed monitor, ix 528; European cruise, 1866, ix 528; steaming radius, xiii 60; *Milwaukee*, data, xii 822; characteristics, xii 1086; bids on, xiii 471; launch and des., xvi 1310; *Minneapolis*, cruiser *No. 13*, des., iii 258, iv 735; bids, iii 459, 758; triple screws, iv 290; launch, v 721; air-pump data, vi 532; official trial, vi 597; data, vi 702; steam consumption of main and auxiliary machinery, x 1; comments on triple screws, xi 641; data compared with protected cruisers, xii 1015; steaming radius, xiii 62; *Missouri*, Act of Congress, x 798; des., x 1163; Thornycroft boilers, xi 232; launch and des., xiv 301; des. and contract trial, xv 1185; *Moccasin*, named, xii 825; data, xiii 476; launch, xiii 767; contract trial, xv 39; *Modoc*, auxiliary navy, x 536; data, x 824; *Mohawk*, auxiliary navy, x 537; data, x 824; *Mohawk*, U. S. R. C., launch, xiv 617; *Monadnock*, speed curves, iii 556; work on, iv 292; reconstructed monitor, ix 528; steaming radius, xiii 62; voyage Philadelphia to San Francisco, 1866, ix 528; monitors, experiences in engine rooms of *Amphitrite*, ix 530; *Montana*, des., xvi 1255; *Monterey*, coast-defense vessel, i 176, 243; authorization and data, i 236; boilers, cylindrical-Ward, data, ii 414; speed curves, iii 556; work on, iv 292; boiler weights, iv 703; des. and contract trials, v 115; air-pump data, vi 532; steaming radius, xiii 62; *Montgomery*, cruiser *No. 9*, des. and bids, i 253, 350; launch, iv 117; work on, iv 294; damage to, v 1034; trial, vi 175; air-pump data, v 532; breakage of crank pin, vi 602; steaming radius, xiii 62; *Morrill*, data, x 534; *Morris*, launch, x 533, 534; des. and trials, x 502; full data.....x 818, xiii 1082
Nanshan, data, x 534; *Nashville*, gunboat *No. 7*, bids, v 1037; des., v 722, vi 176; arrangement of machinery for low power, vi 597; evaporators, viii 95; launch, vii 804; des. and contract trial, ix 574; trial,

Naval Vessels, United States.
notes on, ix 791; steaming radius, xiii 62; Naval Academy practice vessel, bids, ii 408; *Nebraska*, characteristics, xii 810; boiler test, xvi 133; launch and des., xvi 1309; *Nero*, data, x 824; steaming radius, xiii 62; *Nevada*, launch, xii 1095; contract trial, xv 105; comparison of monitor performances, xv 823; *Newark*, authorization and data, i 236, 249; work on, ii 413; crank shafts, fitting up, iii 9; des. and trial, iii 99; power of auxiliary machinery, iii 217; boiler data, iii 422; trials, iii 582; engine data, iii 422; coal consumption, iv 110; propeller data, iv 158, 402; coal endurance, iv 666; air-pump data, vi 532; inertia stresses of valve gear, xii 679; steaming radius, xiii 62; new classification of ships, iv 113; *New Hampshire*, des., xvi 1255; data, xii 529; launch, xvi 1309; *New Orleans*, des., x 529; data, x 534; stability of, xi 1045; steaming radius, xiii 62; coal consumption, xv 366, 379; *Newport*, gunboat *No. 12*, des., i 351, vii 581; bids, vii 804; named, viii 799; launch, ix 140; des. and contract trials, progressive, ix 549; steaming radius, xiii 62; new ships, 1890, ii 409; 1892, naval appropriation bill, iv 493; 1900, xii 234, 528; *New York*, iii 126; vi 661; des., ii 231; bids, ii 407; launch, iv 117; work on, iv 291; boiler weights, iv 703; auxiliary machinery, list, v 66; total number of steam engines and cylinders, v 68; preliminary trials, v 499; contract trial, v 613; air-pump data, vi 532; transatlantic run of, vii 571; steaming radius, xiii 64; coal consumption, xv 366, 379; *Nezinscot*, data, x 534; *Niagara*, data, x 534; *Nicholson*, named, x 818; full data, xiii 1082; launch, xiii 1085; Niclausse boiler installation, xv 1173; *Nipsic*, at Samoa, i 209; disabled propeller, i 356; Normand torpedo boats, comparative data, ix 35; *North Carolina*, des., xvi 1255
O'Brien, named, x 818; full data, xiii 1082; *Ohio*, Act of Congress, x 798; des., x 1163; Thornycroft boilers, xi 232; launch, xiii 472; trials and des., xvi 1027; *Ohio*, repair ship, vii 72; *Olympia*, iv 293, vi 652; des., ii 230; bids, ii 408; launch and des., iv 815; alignment of shafting and boring stern tubes, v 7; preliminary, trial, v 1033; trial, vi 175; contract trial, vi 241; air-pump data, vi 532; full-power run, viii 581; battery compared to *Eclipse*, Br., x 786; data compared with protected cruisers, xii 1015; steaming radius, xiii 64; coal consumption, xv 366, 379; *Oneida*, auxiliary navy, x 537; data, x 824; *Onondaga*, speed, x 828; *Oregon*, ii 575; des., ii 409; work on, iv 292; engine data, iv 820; launch, v 1034; preliminary trial, vi 602; des. and contract trials, viii 439; correction of data, viii 799; voyage, from Puget Sound, Washington, to Jupiter Inlet, Florida, and service in Spanish war, x 621; coal economy on blockade duty, x 1044; time and coal-consumption, voyage, 1898, xii 432; steaming radius, xiii 64; fitting lignum vitae in bearings, xiv 260; coal consumption, xv 366, 379; work of during Spanish-American war, xv 1144; *Osceola*, data..... x 534
Paducah, gunboat *No. 18*, launch, xvi 1313; *Panther*, auxiliary navy, x 537; data, x 824; *Patterson*, auxiliary navy, x 537; data, x 824;

Naval Vessels, United States.

Paul Jones, named, x 818; full data, xiii 1082; contract and standardization trial, xiv 773; *Pawnee*, auxiliary navy, x 535; data, x 824; *Peking*, *City of*, auxiliary navy, x 538; data, x 824; *Pennsylvania*, data, xii 529; trials, xvi 1311; *Peoria*, auxiliary navy, x 538; data, x 824; steaming radius, xiii 64; *Perry*, full data, x 534, xiii 1082, xiv 616; named, x 818; launch, xii 1096; trials, xiii 473; contract and standardization trial, xiv 773; *Petrel*, date of trial, i 83; des., i 237; test of evaporators, i 291; trials, i 355; preliminary trials, i 252; boiler and engine data, vii 422; trials, iii 582; propeller data, iv 158, 402; coal endurance, iv 670; air-pump data, vi 532; run from China to San Francisco, viii 581; steaming radius.....xiii 64

Philadelphia, des., i 236, 249, vi 689; launch, i 355; trials, ii 231, iii 582; trial, ii 412; des. and contract trial, ii 524; power of auxiliary machinery, iii 217; boiler and engine data, iii 422; coal endurance, vi 664; performance data, v 1032; air-pump data vi 532; steaming radius, xiii 64; *Pike*, name, xii 825; des., contract and standardization trials, xv 584; *Piscataqua*, data, x 824; *Plunger*, launch, ix 794; launch and des., x 366; contract trials, xv 859; *Pompey*, auxiliary navy, x 538; data, x 824; *Pontiac*, auxiliary navy, x 538; data, x 824; *Porpoise*, name, xii 825; data, xiii 476; launch, xiii 1085; contract trials, xv 859; *Porter*, trial, ix 401; repairs, x 221; data, x 818; full data, xiii 1082; *Potomac*, data, x 534; *Powhatan*, auxiliary navy, x 538; data, x 824; practice vessel *Chesapeake*, des., i 352; *Prairie*, data, x 534; steaming radius, xiii 64; *Preble*, named, x 818; full data, xiii 1082; contract and standardization trial, xiv 773; *Princeton*, gunboat *No. 13*, des., i 351, vii 581, 804; named, viii 799; steaming radius, xiii 64; progress on, 1899, xii 234; protected cruiser *No. 13*, *Minneapolis*, des., iii 258; protected cruisers, comparison of, *Variag*, *Minneapolis*, *Olympia*, with *Terrible*, *Diadem*, *Blanco Encalada* and *25 de Mayo*, xii 1015; *Protector*, des., xv 1211; *Puritan*, reconstructed monitor, ix 528; steaming radius.....xiii 64

Rainbow, evaporating plant, x 792; data, x 824; *Raleigh*, des. i 349; launch, iv 293; speed curve, iii 556; cylinders, molding in loam and casting, iv 376; boring-bar supports for stern tubes and struts, v 340; forced-draft trial, viii 298; steaming radius, xiii 64; *Ranger*, test of French briquettes, vii 578; *Resolute* auxiliary navy, x 538; data, x 824; des., x 827; *Restless*, auxiliary navy, x 538; data, x 824; revenue cutters, *Nos. 4* and *5*, des., ix 404; *No. 6*, bids, ix 794; *Nos. 9* and *10*, bids, xiii 1087; new, 1900, bids, xii 556; *Rhode Island*, launch, xvi 678; *Rodgers*, progressive trial, accidents, ix 684; data, x 818; trials, xi 892; full data, xiii 1082; *Rowan*, launch, x 534; data, x 818; trials, xi 892; full data, xiii 1082; *Rush*, data.....x 534

St. Louis, data, x 534, xii 822; characteristics, xii 1086; compared to *Prinz Heinrich*, Ger., xiv 334; *St. Paul*, data, x 534; steaming radius, xiii 66; sale of condemned vessels, xii 240; *San Francisco*, des., i 243; launch, i 355; work on, ii 413; des. and contract trial, ii 537; power of auxiliary machinery, iii 217; engine data, iii 422;

Naval Vessels, United States.
boiler data, iii 422; trials, iii 582; propeller data, iv 158, 402; coal endurance, iv 665; boiler weights, iv 703; air pump data, vi 532; screw trials, ix 139; steaming radius, xiii 66; coal consumption, xv 366, 379; *Saturn*, data, x 534; steaming radius, xiii 66; *Scindia*, auxiliary navy, x 538; data, x 824; steaming radius, xiii 66; *Scipio*, data, x 824; *Scorpion*, data, x 534; steaming radius, xiii 66; scout cruisers, bids for building, xvi 1314; sea-going battleship *No. 1*, iv 811; *Seminole*, data, x 824; *Shark*, name, xii 825; data, xiii 476; contract trials, xv 859; *Shearwater*, data, x 824; *Shubrick*, named, x 818; launch, xi 1088; installing propeller shafting, xii 326; launch, xiii 474; contract trial, xiii 586; full data, xiii 1082; *Sioux*, data, x 534; *Solace*, data, x 534; steaming radius, xiii 66; *Somers*, data, x 534; trial, xii 239; full data, xiii 1082; *South Dakota*, characteristics, xii 810; launch, xvi 995; *Southery*, auxiliary navy, x 538; data, x 824; steaming radius of, xiii 50; *Sterling*, data, x 534; steaming radius, xiii 66; *Stewart*, named, x 818; full data, xiii 1082; trials, xiv 1237; des. and contract trial, xv 111; *Stockton*, named, x 818; trials, xiii 256; *Stranger*, data, x 824; *Stringham*, data, x 818; launch, xi 781; accident on trial, xi 902; engine accident, xiii 260; boiler accident, xiii 770; full data, xiii 1082; *Supply*, auxiliary navy, x 537; data, x 824; *Suwanee*, data x 534; *Sylph*, data, x 824; *Sylvia*, data.....x 824
Tacoma, data, xi 508, 1081; des. and contract trials, xvi 1; *Talbot*, des. and trials, x 493; launch, x 533; data, x 818; full data, xiii 1082; steaming radius, xiii 66; *Tallapoosa*, breakdown of air-pump gear, i 248; *Tecumseh*, data, x 534; *Tennessee*, des., xiv 941; horsepower, xiv 1237; launch and des., xvi 1311; *Terror*, pneumatic system for guns, turrets and rudder, ix 14; reconstructed monitor, ix 528; steaming radius, xiii 66; *Texas*, des., i 177, 239, iv 291; work on, ii 412; speed curves, iii 556; work on, iv 291; launch and des., iv 515; dock trial, vi 421, 600; des. and contract trial, viii 82; automatic safety stop valves, viii 592; steaming radius, xiii 66; *Thornton*, named, x 818; launch, xii 825; contract trial, xiii 586; full data, xiii 1082; trials; xiv 304; *Tingey*, named, x 818; launch, xiii 474; full data, xiii 1082; general des., contract trial, xvi 50; *Tonawanda*, see *Amphitrite*; *Topeka*, data, x 534; steaming radius, xiii 66; torpedo boat *No. 2*, bids, iii 260, 595; dimensions, iii 460; *No. 3*, dimensions, viii 799; *Nos. 3, 4* and *5*, des., vi 795; bids, vii 152; *Nos. 4* and *5*, launch, ix 140; *Nos. 6, 7* and *8*, des., vii 583; bids, vii 805; *No. 6*, launch, viii 800; *No. 8, Rowan*, launch, x 534; *Nos. 9, 10* and *11*, bids and des., viii 800; *Nos. 12* to *18*, bids, viii 801; *Nos. 24* to *35*, named, x 817; bids for, x 1173; contractor's request for increased price, xiv 295; for Manila (*Bailey, Barney, Biddle, Porter, Dupont*, xvi 1304; third class, for *Maine* and *Texas*, v 729; torpedo-boat destroyers, Barnaby, on strength of, xiv 396; torpedo cruiser *No. 1*, ii 409; des., ii 411, iii 127; *Trenton*, iv 735; at Samoa, i 211; boiler weights, iv 703; *Truxtun*, named, x 818; launch, xiii 770; full data, xiii 1082; speed, xiv 948; contract and progressive trial, xiv 1083; *Tuscarora*, launch and des., xiii 1086; trial.....xiv 1237

Naval Vessels, United States.
Uncancomuck, auxiliary navy, x 538; data, x 824; *Uncas*, data, x 534; *Union*, des.....xi 159
Vandalia, effect of foul bottom on horsepower and speed, i 74; at Samoa, i 211; vessels under construction, 1898, x 1175; *Vesuvius*, i 242, 249; trials, i 82, iii 582; trial, ii 231; horsepower data, ii 417; des., ii 419; engine vibrations, iii 16; engine data, iii 422; boiler data, iii 422; propeller data, iv 158, 402; steaming radius, xiii 66; *Vicksburg*, gunboat *No. 11*, vii 804; des., vii 581; named, viii 799; launch, ix 140; des. and contract trials, progressive, ix 549; steaming radius, xiii 68; *Vigilant*, auxiliary navy, x 539; data, x 824; *Viking*, auxiliary navy, x 539; data, x 824; *Virginia*, launch, xvi 334; launch and des., xvi 676; *Vixen*, data, x 534; steaming radius, xiii 68; *Vulcan*, auxiliary navy, x 535; data, x 824; des., x 592; note, x 825; repair ship.....xiv 1031
Waban, data, x 824; *Wampanoag*, engines of, iv 713; *Wampanoag*, *Trenton* and cruiser *No. 13*, comparative data, iv 737; *Walter Q. Gresham*, launch, viii 803; warships and auxiliaries purchased during Spanish war, x 534; *Wasp*, data, x 534; *Washington*, des., xiv 941; horsepower, xiv 1237; balance cylinders, xvi 905; water barge *No. 1*, data, x 824; water-tube boilers in, xv 925; *West Virginia*, characteristics, xii 810; boilers, Babcock & Wilcox, xvi 1223; trials, xvi 1311; *Wheeling*, gunboat *No. 14*, vii 583, 804; named, viii 799; launch, ix 401; des. and contract trial, progressive, ix 641; runs, x 826; steaming radius, xiii 68; *Whipple*, named, x 818; launch, xiii 770; full data, xiii 1082; speed, xiv 948; contract and progressive trial, xiv 1083; *Wilkes*, named, x 818; full data, xiii 1082; launch, xiii 1084; contract and standardization trial, xiv 856; *Wilmington*, v 1037; des., v 727, vi 176; launch, vii 804; contract trials, ix 360; steaming radius, xiii 68; *Windom*, data, x 534; *Winslow*, trial, x 219; repairs, x 221; data, x 818; full data, xiii 1082; *Wisconsin*, viii 596; bids and engines, viii 797; launch, xi 232; contract trial, xii 979; auxiliary machinery, xii 992; *Wisconsin* and class, coal consumption, xv 366, 379; *Witlick, Mary*, auxiliary navy, x 539; *Wompatuck*, data, x 534; *Woodbury*, data, x 534; *Worden*, named, x 818; launch, xiii 770; full data, xiii 1082; contract and progressive trial, xiv 1083; *Wyoming*, Act of Congress, x 813; bids, x 1169; launch, xii 1094; trials, xiv 1237; contract and progressive trial, xv 83; comparison of monitor performances.....xv 823
Yale, auxiliary navy, x 539; data, x 824; *Yankee*, data, x 534; *Yankton*, auxiliary navy, x 538; data, x 824; *Yorktown*, i 36; des., i 237; readiness for trial, i 83; description and contract trials, i 137; preliminary trials, i 252; combined indicator cards, i 268; test of evaporators, i 291; trials, measured mile, progressive, i 355, iv 587; engine vibrations, iii 16; power of auxiliary machinery, iii 217; engine data, iii 422; boiler data, iii 422; trials, iii 582; propeller data, iv 158, 402; coal endurance, iv 641, 642; economical speed and coal per I.H.P., iv 671; air-pump data, vi 532; steaming radius, xiii 68; *Yorktown*, *Concord*,

Naval Vessels, United States.
Bennington, trial results compared, iii 216; *Yosemite*, data, x 534; loss of, xii 1097; steaming radius.....xiii 68
Naval vessels, Argentine Republic.
Bathurst, des. and trial, iii 142; *Buenos Aires*, des. and trial, vii 806; viii 607
Corrientes, launch, viii 805; trials, ix 140; *Charbues*, data.....xiv 949
Destroyers (four).....viii 383
Espora, des., iii 285; *Entre Rios*, trials, viii 805; data.....ix 141
Garibaldi, Jose, des., viii 605; trials, viii 803; accident on, xii 1047; *General San Martin*, des., x 830; *General Mitra*, data, xiv 307; *General Roca*, data.....xiv 307
Independencia, des.....v 229
Julio, 9 de, trials and des., v 501; performance data.....v 504
Libertad, des.....v 229
Majpu, data, xiv 949; *Mayo, 25 de*, performance data, v 504; trial and des., iii 140; data compared with protected cruisers, xii 1015; *Missiones*, speed.....viii 805
Necochea, launch, ii 428; Niclausse boiler installations.....xv 1173
Patria, launch, vi 176; des. and trials, vi 799; *Presidente Sarmiento*, des. ix 795; *Pueyrredon*, note.....x 830
Rosales, des.....iii 285
San Martin, launch and des., viii 605; *Santa Fe*, launch and des., viii 609; data.....ix 141
Torpedo-boat destroyers ordered from Yarrow.....viii 161
Varese, purchase.....x 830
Naval vessels, Austria.
Adler, boiler explosion, xii 197; armored cruiser, 1898, des., x 539; *Arpad*, des.....xii 1089
Boa, speed, x 1177; *Buda-Pesth*, des., vii 811; launch, viii 610; trials, x 222
E, data, xiii 1088; compared to *Kléber*, xiv 1255; *Erzherzog Friedrich*, launch.....xvi 679
Franz Josef I, des. and trial.....iii 136
Habsburg, launch and des., xiii 260; trials.....xiv 1238
Jaguar, dimensions.....ix 405
Kaiserin Elizabeth, launch and des., ii 584; *Kaiser Karl VI*, des. and trials, xii 826; trials, xiii 262; *Kaiserin und Königin Maria Theresia*, des. and trials.....vii 153
Leopard, experiments with propellers.....xvi 126
Magnet, trials, viii 805; data, ix 405; *Monarch*, des., vii 417; trials....x 222
Natter, note, viii 385; trials.....viii 806
Pelican, torpedo depot ship, des. and trial.....iv 319
Ram cruiser *D*, des.....viii 161
St. George, launch, xvi 335; *Satellit*, des., vi 423; note on, vi 619; *Szigetvár*, data.....xiii 1090
Tegethoff, new machinery.....vi 421
Viper, trial, viii 384; note.....viii 806
Wien, launch, vii 811; speed, ix 141; trials.....x 222
Yarrow boilers in.....xv 838
Zenta, launch and des.....ix 796

Naval Vessels, Brazil.
Almirante Tamanderé, des., ii 427; *Amazonas*, des., ix 142; see *Albany*; *Aurora*, des.....vi 177
Barrozo, launch.....viii 806
Caramaru, launch.....viii 611
Marshall Deodoro, note, ix 141; des., x 836; *Marshall Floriano*, note, ix 141; data, ix 405; *Marshall Floriano*, launch.....xi 782
Republica, launch.....iv 527
Timbiri, note, ix 406; *Tiradentes*, launch and des., iv 527; torpedo boats, des., iii 608; torpedo boats (five).....vii 418
Naval vessels, British.
Aboukir, launch and des., xii 835; trials, xiii 717, xiv 206; *Active*, des., i 267; *Adventure*, *Attentive*, *Sentinel*, *Skirmisher*, *Forward*, *Foresight*, *Pathfinder*, *Patrol*, scouts, xvi 985; *Adventure*, data, xvi 1324; *Aeolus*, work on, ii 421; *Africa*, machinery contracts, xvi 338; *Ajax*, des., i 265; *Alarm*, launch, iv 832; details, v 226; des., v 510; trials, v 748; *Albatross*, note, viii 622; data, ix 420; trials, xiii 271; *Albemarle*, launch, xiii 487; *Albion*, note, viii 807; launch and des., x 841; trials, xiii 274, 277, xiv 206; speed, xiii 488; *Alert*, des., v 518, vi 203; trials, vii 428; coal consumption, viii 172; *Algerine*, dimensions, vi 615; trial, viii 392; *Amethyst*, des. and trials, xvi 343, 360; turbines, compared with *Topaze*, *Sapphire* and *Diamond* reciprocating engines, xvi 1242; *Amphitrite*, des., viii 827; launch and data, x 862; trials, xi 377, xii 246; *Andromache*, performance data, iii 597; *Andromeda*, des., vii 418, 813; trials, xi 243, 322; Gibraltar to Malta, xii 736; Malta to Naples, xii 638; *Angler*, launch, ix 420; trials, x 858; *Anson*, des., i 264; defects, iii 131; coal consumption, xiii 1029, 1031, 1032; *Antelope*, des. and trial, vi 200; *Antrim*, combination boilers, Yarrow and cylindrical, xiv 920; launch and des., xvi 344; *Apollo*, performance data, iii 597; *Ardent*, des. and trial, vii 168; coal consumption, vii 423; trials, xi 328; *Arethusa*, des., i 171, 264; *Argonaut*, des., viii 827; trials, xi 243, 247; machinery data, xi 330; trials and experiments, xi 361; *Argonaut* class, data, xi 242; *Argyll*, combination boilers, Babcock & Wilcox and cylindrical, xiv 921; launch and des., xvi 679; *Ariadne*, des., viii 827; launch and des., x 563; trials, xi 246, xii 246; *Ariel*, launch, ix 420; *Arrogant*, des., vii 419, 814; launch and des., viii 617; trials, ix 802; machinery data, xi 330; Bantry to Plymouth, Gibraltar to Plymouth, xii 738; liquid fuel, xiv 308, *Arun*, trials, xvi 259; *Assaye*, launch, iii 269; *Astraea*, launch and des., v 518; trials, vi 199; note, viii 171; *Aurora*, des., i 265; defects in machinery, iv 303; *Australia*, trials, i 180; des., i 264; des. and trial, iv 278; boiler data, iv 507; machinery data, viii 568; *Avon*, machinery data viii 568; launch.....viii 844
B fleet, fuel economy in maneuvers of 1901, xiii 1028; *Bacchante*, launch and des., xiii 483; trials, xiv 206, 308; *Banshee*, des. and trials, vii 424; note, vii 821; *Barfleur*, des., iii 131; launch and des., iv 829; details, v 226; trials, vi 182, 197; size and cost, vi 495; *Barham*, trials, ii 421, v 517, xi 1102, xii 24 6; machinery trial, v 743; overhaul,

Naval Vessels, British.
viii 391; speed, xi 783; *Barracouta*, des. and trial, ii 232; boiler accident, ii 233; *Barrosa*, trials, ii 583; *Basilisk*, trials, i 357; *Bat*, speed, ix 420; trials, ix 806; boiler explosion, xii 567; battleships, machinery data, *Benbow*, *Howe*, *Rodney*, *Camperdown*, *Collingwood*, *Anson*, *Nile*, *Tafalgar*, *Hero*, *Hood*, *Empress of India*, *Repulse*, *Royal Sovereign*, *Ramillies*, *Resolution*, *Revenge*, *Royal Oak*, *Barfleur*, *Centurion*, vii 348; battleship, steam trials, vi 177; *Beagle*, trial i 357; *Bedford*, des., xiii 1102; trials, xiv 949, 1244; *Belleisle*, des., i 266; experiment, xii 830; *Bellona*, overhaul, viii 391; trials, xii 246; *Benbow*, coal-consumption, xiii 1029, 1031, 1032; *Berwick*, launch and data, xiv 1244; trial, xvi 258; *Bittern*, machinery data, viii 568; launch, ix 421; *Black Prince*, des., i 265; criticism, xvi 1274; launch and des., xvi 1322; *Black Prince* and *Achilles* classes, compared to *Minotaur* class, xvi 1278; *Blackwater*, trials, xvi 259; *Blake*, characteristics, iii 142; note on, iii 559; trial and des., iv 121; speed, v 508; refit and trials, viii 168; boiler explosion, viii 614; Gibraltar to Sierra Leone, xii 736; *Blanche*, trials, defective boilers, ii 234; defects in, iii 131; trials, xiii 274; *Blenheim*, launch, ii 419; characteristics, iii 142; trials, iv 306, 831; performance data, v 504; correction to trial data, v 508; Stockholm to Sheerness, xii 736; boilers of, xi 741; boiler defects in, iv 273; *Bonaventure*, details, v 226; trial, vi 803; *Boxer*, des. and trial, vii 169, 715; *Boyne*, launch, xvi 1326; *Bramble*, contract, ix 804; trials, xii 246; *Brazen*, data, vii 820; launch, viii 621; trials, xiii 271; *Brilliant*, work on, ii 421; trials, iv 832; *Britomart*, contract, ix 804; trials, xii 247, xiii 274; *Britannia*, machinery contracts, xvi 338; *Bruiser*, launch and des., vii 419; *Bullfinch*, trials, xiii 271; trials, xiv 208; *Bulwark*, launch and des., xi 1099; trials, xiii 717, xiv 206; *Bulwark* class, trials.....xi 320
Cadmus, note, xiv 637; trials, xvi 339; *Caesar*, vi 423; launch, viii 810; trials, ix 801, xi 318; *Calliope*, at Samoa, i 209; *Calypso*, des., i 264; *Cambrian*, launch and des., v 510; *Camperdown*, vi 107; des., i 270; endurance trial, iii 132; collision with *Victoria*, v 693, vi 471; injury in collision with *Victoria*, v 1041; coal consumption, xiii 1029, 1031, 1032; *Canopus*, note, viii 612, 807; data, ix 408, xi 241; launch, ix 802; battery compared to *Alabama*, x 786; machinery data, xi 330; trials, xi 1100, xii 246; Spezzia to Malta, xii 738; *Canopus* class, trials, xi 320; *Carnarvon*, combination boilers, Niclausse and cylindrical, xiv 921; launch and des., xvi 344; *Centurion*, details, v 226, vi 182; trial, v 1044; ordnance trials, vi 168; des., vi 495; *Challenger*, data, xiv 950; trials, xvi 258; *Chamois*, launch, ix 174; trials, ix 805; loss of, xvi 1327; *Charger*, trials, xi 328, xiv 208; *Charybdis*, trial, vi 605; *Cheerful*, launch, ix 808; speed, x 1196, xi 1101; *Cherwell*, trials, xvi 690; *Circe*, launch and des., iv 533; details, v 226; des., v 510; des. and trial, vi 200; trials, xvi 258; *City of New York*, *City of Paris*, auxiliary cruisers, i 167; classified speeds, British Navy, v 190; *Clio*, note, xiv 637; trials, xvi 258, 346; *Cobra*, wreck, xiii 1033; *Collingwood*, des., i 170, 265; coal consumption,

Naval Vessels, British.
xiii 1029, 1031, 1032; *Colossus*, coal consumption, xiii 1029, 1031, 1032; *Columbia*, auxiliary cruiser, i 168; *Commonwealth*, data, xiii 770, xiv 1251, xvi 998; comparison, cost, etc., xvi 992; *Condor*, dimensions, ix 804; trials, xii 564, xiii 274; *Conflict*, machinery, viii 621; speed, x 860; *Conqueror*, des., i 170, 265; boiler data, iv 507; *Contest*, des. and trials, vii 424; *Coquette*, speed, xi 1103; *Cornwallis*, launch and data, xiii 717; launch and des., xiii 1110; trials, xvi 258; *Cornwall*, engines of, xvi 684; *County* class, compared to *Prinz Heinrich*, xiv 334; *Crane*, launch, ix 174; trials, x 225; *Crescent*, des., iii 134; details, v 226; machinery, v 746; speed, vi 616; coal consumption, vii 415; machinery data, xi 330; machinery space, xiii 867; *Cressy*, des., xii 242; trials, xiii 274, 277; *Cressy* class, x 54; data, xi 242; criticism of, in naval maneuvers, 1888, i 170; cruisers, function and design of, xvi 1274; new, compared with *Powerful*, *Niobe*, *Doris*, viii 557; first-class, *Australia*, *Orlando*, *Undaunted*, *Immortalité*, *Narcissus*, *Galatea*, *Aurora*, *Blake*, *Blenheim*, *Edgar*, *Hawke*, *Endymion*, *Gibraltar*, *St. George*, *Royal Arthur*, *Crescent*, *Grafton*, *Theseus*, *Vulcan*, vii 350; second-class, *Mersey*, *Severn*, *Thames*, *Forth*, *Andromache*, *Apollo*, *Indefatigable*, *Intrepid*, *Iphigenia*, *Latona*, *Melampus*, *Naiad*, *Pique*, *Rainbow*, *Retribution*, *Sappho*, *Scylla*, *Sirius*, *Spartan*, *Sybille*, *Terpsichore*, *Thetis*, *Tribune*, *Aeolus*, *Brilliant*, *Bonaventure*, *Cambrian*, *Charybdis*, *Flora*, *Astraea*, *Fox*, *Forte*, *Hermoine*, vii 352; third-class, *Barrosa*, *Barracouta*, *Blanche*, *Blonde*, *Katoomba*, *Mildura*, *Wallaroo*, *Tauranga*, *Ringarooma*, *Barham*, *Bellona*, *Pallas*, *Pearl*, *Philomel*, *Phoebe*, vii 356; *Scout*, *Fearless*, *Archer*, *Brisk*, *Cossack*, *Mohawk*, *Porpoise*, *Tartar*, *Raccoon*, *Medea*, *Medusa*, *Marathon*, *Magicienne*, *Melpomene*, vii 354; *Curlew*, des., i 264; *Cyclops*, des.....i 266
Daphne, trials, i 86; *Daring*, launch, vi 204; des., vi 605, vii 720; trials, vi 611, xi 328; discussion and data, vii 713; cavitation of propellers, ix 678; explosion, xiii 733; *Dasher*, trials, xi 328, *Decoy*, trials, vi 804; loss of, xvi 1327; defective boilers in English war vessels, iv 103; *Desperate*, des., viii 182; launch and trials, viii 399; accident to, viii 621; trial, viii 842; destroyers, vii 796; new, ix 809; 30-knot, dimensions, vii 820; water-tube boilers in, vii 797; speed and performance, xvi 956; *Devastation*, des., i 264; ferruled boiler tubes, iv 837; trial, v 1046; *Devonshire*, combination boiler, Niclausse and cylindrical, xiv 921; launch, xvi 682; *Devonshire* class, boiler discussion, xiv 606; *Diadem*, des., vii 418; note, vii 814; data, viii 828, x 1197; trials, x 240, 425, xi 243, 322; trial data, x 430; auxiliary machinery, coal-consumption data, x 434; machinery and speed, x 568; machinery data, xi 330; compared to *Jeanne d' Arc*, xi 797; Gibraltar to the Nore, xii 736; Arosa Bay to Sheerness, xii 738; data, comparison with protected cruisers, xii 1015; boilers, xvi 921; *Diadem* and *County* class compared, xvi 1268; *Diamond*, launch, xvi 343; reciprocating engines, compared with *Amethyst*, turbines, xvi 1242; *Diana*, launch, viii 170; trials, viii 833, xi 324; boilers, xii 714;

Naval Vessels, British.
Dido, launch and des., viii 388; trials, ix 162, xi 324; *Dominion*, data, xiii 770, xiv 1251; trials and des., xvi 1315; *Donegal*, launch and des., xiv 1245; trials, xvi 258; *Doone*, launch, xvi 1326; *Doris*, launch, viii 390; characteristics, viii 557; launch and trials, ix 162; coal consumption, ix 414; trials, xi 324; *Dove*, trials, xiii 271, xiv 208; *Dragon*, des. and trials, vii 424; *Drake*, launch and des , xiii 486; machinery trials, xiv 310; trials, xiv 950; trial results, xiv 1241; experiments with propellers, xiv 1248; screw propellers, xvi 308; *Drake* class, data, xi 518; *Dreadnought*, speed and power, vi 493; coal consumption, xiii 1029, 1031, 1032; *Dryad*, des., iv 833; launch and des., vi 614; *Duke of Edinburgh*, launch and des., xvi 1001; *Duncan*, machinery space, xiii 867; *Duncan* class, data, xi 517; des., xiv 953; *Dwarf*, contract, ix 804; des., x 1186; trials.....xii 246
Earnest, launch, ix 174; *Eclipse*, v 516; launch and des., vi 604; trials, viii 615, xi 324; battery compared to *Olympia*, x 786; *Eden*, trials, xvi 342; *Edgar*, des., iii 134; trial and des., iv 122; performance data, v 504; machinery data, viii 568; *Edgar* class, characteristics, iii 142; trials, xi 322; *Edinburgh*, coal-consumption, xiii 1029, 1031, 1032; *Electra*, launch, viii 621; trials, xiii 271; *Elk*, des., i 266; *Empress of India*, trials, vi 182; *Encounter*, boilers and engines, xiii 280; launch and data, xiv 954: *Endymion*, des., iii 134; trials, v 745; *Erne*, trials, xvi 259, 347; *Espiégle*, data, vii 173, xi 1103; Babcock & Wilcox boilers, xiii 772; trials, xiii 1107, xiv 206; boilers, xvi 920; *Essex*, des., xiii 1104; trials, xvi 258; *Essex* class, xii 1101; *Ettrick*, trials, xvi 259, 346; *Europa*, des., vii 418; note, vii 814; launch, ix 414; des. and trials, x 846; trials, xi 243, 322; refit, xiv 955; *Euryalus*, launch and des., xiii 773; trials, xvi 258; *Exe*, trials, xvi 259, 341; *Exmouth*, launch, xiii 1111; trials, xiv 952, 1248; *Express*, note, viii 622, ix 173; launch, x 225; trial data, xiii 774, xiv 208; speed.....xiv 324
Falcon, trials, xii 838, xiii 271; *Fame*, des., vii 820, viii 182; launch, viii 400; trials, ix 419; coal consumption, ix 173; des. and trials, x 226; *Fantôme*, data, xi 1103, xiii 489; coal consumption, xiv 310; boilers, xvi 920; *Fawn*, launch, ix 420; *Fearless*, speed, xiv 312; *Ferret*, note, vii 821; des. and trial, vi 613; trials, xi 328; fleet cruisers, 1894, des., vi 804; *Flora*, trial, vi 605; machinery data, viii 568; refit, xiv 1248; grounding of, xvi 347; *Flying Fish*, launch, ix 420; speed, ix 807; coal consumption, x 571; *Foam*, des., vii 820, viii 182; launch, viii 844; *Foresight*, launch, xvi 1325; *Formidable*, data, x 861, xi 241; launch, x 1179; des., xi 240; trial, xiii 774, xiv 206; in-turning screws, xiii 1082; *Formidable* class, trials, xi 320; *Forte*, des., iv 118; engines, iii 129; *Forth*, des., i 265; *Forward*, launch, xvi 1324; *Fox*, des., iv 119; trials, vi 802; *Foyle*, trials, xvi 259, 342; *Furious*, des., vii 419, ix 163; note, vii 815; coal consumption, x 565; trials, x 859, xi 243; Bantry to Portland, Gibraltar to the Downs, Las Palmas to England.....xii 638
Galatea, breakdown, i 255; defects in, i 260; des., i 265; des. and trials, iv 278; boiler data, iv 507; machinery trial, v 743; *Gibraltar*, des., iii 134;

Naval Vessels, British.
launch and des., iv 534; details, v 226; des. and trials, v 731; *Gipsy*, launch, ix 421; speed, x 573; *Gladiator*, des., vii 419; launch, ix 165; trials, xii 246; *Glatton*, des., i 266; *Gleaner*, trials, iv 120; boiler accident, iv 305; *Glory*, note, viii 807; data, ix 408; des., xi 519; trials, xiii 274; *Goliath*, note, viii 807; launch and des., x 567; trials, xii 246, 248; *Good Hope*, launch and des., xiii 484; des. and trials, xiv 619; trials, xiv 950; trial results, xiv 1241; voyage to Cape Colony, xv 259; *Gorgon*, des., i 266; *Gossamer*, trials, iii 598; speed, xiv 955; *Grafton*, des., iii 134; details, v 226; launch and des., v 504; trials, v 744; coal consumption, vii 415; *Grasshopper*, des., i 171, 265; trials, i 261; *Greyhound*, trials, xiv 208; coal consumption, xiv 323; experiments on, xvi 306; gunboats, light-draft river.....x 783
Halcyon, des., iv 833; trial, vi 614; *Hampshire*, combination boilers, Yarrow and cylindrical, xiv 921; launch and des., xvi 344; *Handy*, launch, vii 426; machinery, viii 393; *Hannibal*, data, vi 423; launch, viii 612; trials, x 227, xi 320; oil-fuel fittings, xiv 642; *Hardinge*, data, xiii 488; *Hardy*, trial, viii 620; *Harrier*, des., iv 833; launch and des., vi 426; trials, vi 803; *Hart*, data, vii 426; trial, viii 180; machinery, viii 393; *Hasty*, trials, xiv 208; *Haughty*, launch, vii 823; trials, viii 180, 397; *Havock*, des., v 655, vi 203; des. and trial, v 1056; speed and power, vii 426; trials, xi 328, xiii 271; *Hawke*, des., iii 134; *Hazard*, des., iv 833; trials, vi 426; *Hebe*, launch and des., iv 533; details, v 226; des. and trial, vi 200; *Hecate*, des., i 266; *Hecla*, des., i 264; *Hercules*, des., i 265; engines, iii 269; engine notes, v 220; speed and power, vi 493; *Hermes*, battery, ix 415; des., ix 165; launch and des., x 545; trials, xi 789, xii 246; repairs, xiii 280; boilers, xii 717, xvi 920; *Hermione*, boiler test, evaporative, vii 151; trials, vii 815; boiler trials, xvi 458; *Hero*, des., i 170, 264; *Heron*, note, x 227; des., x 556; *Herty*, des., i 266; *Hibernia*, machinery contracts, xvi 338; *Highflyer*, des., ix 165; battery, ix 415; launch, x 859; trials, xi 789, xii 246, 563; comparative tests; xii 251; boilers, xii 711; *Hindustan*, launch, xvi 339; *Hogue*, launch and des., xii 837; machinery space, xiii 867; note, xiii 1101; trials, xiv 206, 312; *Hood*, trials, vi 182; qualities and performance, vi 464; *Hornet*, boiler test, vi 163; speed and power, vii 426; des. and trials, vi 424; trials, xi 328; *Hotspur*, des., i 266; *Howe*, des., i 164; endurance trial, iii 133; speed and power vi 493; coal consumption, xiii 1029, 1031, 1032; *Hunter*, launch, viii 180; machinery, viii 393; *Hussar*, des., iv 833; *Hyacinth*, des., ix 165; battery, ix 415; launch and des., x 1190; trials, xii 246, xiii 280, 698, 1004; speed, xii 248; compared to *Jurien de la Gravière*, Fr., xiv 325; data compared with *Minerva*, Br., and *Saxonia*, mer. str., xiv 460; boilers, xvi 919; *Hyacinth* and *Minerva*, trials, 2d report, xiv 458, 473–4; trials, xiv 638; Delaunay-Belleville comment, xiv 905; *Hydra*, des.....i 266
Illustrious, data, vi 423; floated, viii 810; coal consumption, x 228; des. and trials, x 550; trials, xi 243, 320; *Immortalité*, des., i 264; *Implacable*, data, x 861; launch and data, xi 521; trials, xiii 488, xiv 206; *In-*

Naval Vessels, British.
constant, des., i 266; *Indefatigable*, launch and des., iii 265; trials, iv 120; *Inflexible*, des., i 264; *Invincible*, des., i 265; *Iphegenia*, failure on trial, ferruled boiler tubes, iv 837; *Iris*, des., i 264; trials, ii 234; screw propellers, xvi 308; *Iron Duke*, des., i 264; *Irresistible*, dynamos and engines, xi 507; trials, xiv 206; repairs, xiv 314; *Isis*, launch, viii 618; des., ix 414; trials, xi 324; *Itchen*, trials.....xvi 259
Jackdaw, note, x 227; *Janus*, launch and des., vii 425; des. and trials, viii 835; trials, xi 328; *Jaseur*, launch, iv 833; details, v 226; des. and trial, vi 200; *Jason*, launch and des., iv 532; des., details and trial, v 226, vi 200; machinery data, viii 568; trials, xvi 258; *Jed*, trial, xvi 1008, 1326; *Juno*, launch and des., viii 169; characteristics, viii 560; machinery data, viii 568; trials, xi 324; *Jupiter*, launch, viii 163; trials.....ix 406, xi 318
Kale, launch, xvi 1326; *Kangaroo*, speed, xiii 491; trials, xiv 208; *Kennet*, trials, xvi 1008, 1326; *Kent*, des., xii 559; launch and des., xiii 486; engines, xvi 683; *King Alfred*, dimensions, machinery weights, data, xiii 862; machinery space, xiii 867; launch and des., xiii 1098; compared to *California*, *Gromoboi*, *Victor Hugo*, *König Wilhelm*, xiv 314; note, xiv 955; contract trials, xiv 1239; *King Edward VII*, data, xiii 770, xiv 637; *King Edward VII* class, data, xiv 643
Lancaster, launch and des., xiv 639; trials, xvi 258; engines, xvi 683; *Lapwing*, trials, i 260; *Latona*, launch and des., ii 420; trial, iii 266; performance data, iii 597; v 504; compared with new cruisers, viii 561; machinery data, viii 568; *Leda*, launch, iv 832; des., v 226, 510; des. and trial, v 1060, vi 200, xvi 258; *Lee*, trials, xiii 271; coal consumption, xiii 281; *Leopard*, launch, ix 421; *Leviathan*, launch and des., xiii 775, 1109, xiv 640; des. and contract trials, xiv 950, 955; trial results, xiv 1241; *Liffey*, launch, xvi 1326; *Lightning*, launch and des., vii 425; accident to, viii 172; des. and trials, viii 835; *Lively*, trials, xiii 491, xiv 208; *Locust*, launch, ix 174; coal consumption, x 237; trials, x 571; *London*, launch and des., xi 1097; trials, xiv 641; *Lord Nelson* class, data, xvi 1320; and *King Edward* class, compared, xvi 1271; *Lynx*, preliminary trials, vi 614; trials, vi 804; accident, vii 170; repairs to, vii 821; grounding.....ix 807
Machinery of British war ships, vii 322; *Magnificent*, des., v 516, 1038; launch and des., vii 161; trials, vii 811, xi 318; *Magicienne*, progress on, i 87; trials, i 178; defects on trials, i 255; des., i 264; defects in boilers, iv 279; boiler data, iv 507; *Magpie*, trials i 261; *Majestic*, des., v 516, 1038; launch and des., vii 167; trials, vii 812, xi 318; machinery data, viii 568, xi 330; progressive trials, viii 811; data, xi 241; machinery space, xiii 867; *Majestic* and *Teutonic*, auxiliary cruisers, i 167; *Mallard*, des., vii 820, viii 182; launch, ix 174; trials, ix 804; *Marathon*, progress on, i 87; trials, i 256; des., i 265; boilers, defects in, iv 279; *Mars*, launch, viii 386; trials, ix 407, xi 318; oil-fuel fittings, xiv 642; *Medea*, des. and trials, i 87, 265; boiler defects, i 255, iv 279; defects in machinery, i 258; boiler data, iv 507; Yarrow

Naval Vessels, British.
boilers xiv 643, xvi 919; *Medea-Medusa*, Br., comparative trials, xvi 336; *Medina*, des., i 267; *Medusa*, nearing completion, i 87; trials, i 178; boiler defects, i 255; iv 279; des., i 267; boiler data, iv 507; performance data, v 504; Dürr boilers, xiv 643; boilers, xvi 919; *Medusa* class, influence of foul bottom on speed, ii 420; *Medway*, des., i 266; *Melampus*, trial, iii 460; performance data, iii 597; *Melpomene*, progress on, i 87; trials, i 257; des., i 265; *Mercury*, des., i 265; *Merlin*, data, xiv 320; *Mermaid*, launch, x 572; speed, x 1195; *Mersey*, des., i 264, 170; *Minerva*, des., v 516; note, vii 815; trials, viii 832, xi 324, xii 563, xiii 489, 698, 1004; comparative tests, xii 251; boilers, xii 711, xvi 919; boiler tests, xiii 281; data, compared with *Hyacinth*, and *Saxonia*, mer. str., xiv 460; *Minerva* class, characteristics, viii 560; *Minerva* and *Hyacinth*, trials, xiv 638; trials, second report, xiv 458, 473-4; boiler discussion, xvi 515; *Minotaur* class compared with *County* and *Diadem* classes, xvi 1269; *Minotaur*, *Defense*, *Orion*, *Shannon*, xvi 1323; *Monarch*, des., i 264; remodeled, vi 800; *Mohawk*, des., i 265, 171; *Monmouth*, launch and des., xiv 318; projected trials, xiv 1248; trials, xvi 258; *Monmouth* class, machinery space, xiii 867; *Montague*, launch, xiii 487; trials, xiv 1249; *Moorhen*, launch, xiii 1112; *Mutine*, boiler explosion, xiii 281; data, xiii 489; trials, xiv 206; speed, xiv 320; *Myrmidon*, speed, xiii 491; trials.....xiv 208
Naiad, launch, iii 131; performance data, iii 597; *Narcissus*, des., i 265; Naval Defense Act, 1889, ships provided, iii 261; *Nelson* class, xvi 998; *Neptune*, des., i 265; new battleships, 1894, vi 423; new second-class cruisers, v 516; new cruisers, 1895, vii 418; new scouts, xvi 985; new torpedo craft of the British Navy, v 655; new warships, 1902, boilers, xiv 234; *New Zealand*, launch, xvi 682; Niclausse boiler installations, xv 1172; *Niger*, details, v 226; machinery trial, v 743; new engines and boilers, xiv 1249; *Nile*, coal consumption, xiii 1029, 1031, 1032; *Niobe*, des., vii 418; note, vii 814; comparison with new cruisers, viii 557; machinery data, viii 568; launch and des., ix 409; trials, x 856, xi 243, 322; run in English Channel, xii 738; *Northampton*, des., i 172, 265; *Northumberland*, des., i 264; *Nymphe*, trials, i 86; des.....i 264
Ocean, note, viii 807; data, ix 408, x 862; trials, xi 795, xii 243, 246; *Odin*, data, xiv 320; trials, xiv 961; *Onyx*, launch, iv 833; details, v 226; des. and trial, vi 200; *Opossum*, trials, viii 396; repairs, viii 843; *Orlando*, des. and trial, i 91; *Osprey*, speed, ix 808; launch, xii 565; trials, xii 838, xiii 271; *Otter*, launch.....ix 174
P class, trials, i 85, xiii 282; removal of ventilating cowls, xiv 321; *Pactolus*, data, viii 618, 834; launch, ix 168; trials, x 1197, xi 243, 326; *Pallas*, trial, iii 268; *Pandora*, des., i 358; data, xii 247; trials, xiii 274, 282, xiv 206; speed, xiii 490; screw propellers, xiii 776; *Panther*, launch, ix 174; speed, ix 808; *Partridge*, trials, i 85; *Pathfinder*, launch, xvi 1007; *Patrol*, launch, xvi 1325; *Peacock*, trials, i 85; *Pearl*, trial, iii 268; *Pegasus*, dimensions, viii 391; launch and des., ix 417; trials,

Naval Vessels, British.
x 1195, xi 243, 326; *Pelorus*, des., i 358, vii 419; machinery contract, vii 600; launch and des., viii 390, ix 166; machinery data, viii 568, xi 330; hull and machinery, ix 416; run, x 228; trials, xi 326; machinery space, xiii 867; *Pelorus* class, comparison with Barrow cruisers, viii 557; characteristics, viii 563; *Perseus* des., i 358; dimensions, viii 391; launch, ix 804; trials, xi 243, 326, xii 246; speed, xi 1103; *Petrel*, coal consumption, xii 564; trials, xiii 271; *Phaeton*, data, viii 392; *Pheasant*, trials, i 85; *Philomel*, launch, ii 583; *Phoebe*, trial, iii 598; *Phoenix*, des., i 358; dimensions, vi 615; launch and des., vii 428; trials, viii 171; *Pigeon*, trials, i 85; *Pigmy*, trials, i 85; des., i 267; *Pioneer*, ordered, ix 804; trials, xii 246; *Pique*, des. and trial, v 211; launch and des., iii 130; *Plassy*, launch, ii 421; *Plover*, trials, i 85; des., i 266; *Pomone*, data, viii 834; trials, xi 326, xii 246; *Porcupine*, unsuccessful trial, viii 398; des. and trials, viii 835; *Porpoise*, speed, x 229; *Powerful*, note on, v 516; des., vi 197; launch and des., vii 599; comparison with new cruisers, viii 557; machinery data, viii 568, xi 330; speed, viii 613; trials, viii 813, ix 145, 802, xi 322; run to China, x 229; defects, x 559; data, x 1186; runs compared with *Terrible*, xii 737; Belleville boilers, xiv 648, 917; repairs, xiv 962; *Powerful* class, data, xi 242; *Prince Albert*, des., i 266; *Prince George*, data, vi 423; launch, vii 813; trials, viii 809, xi 318; *Prince of Wales*, launch and des., xiv 647; data, xiv 962; trials, xvi 258, 343; *Prometheus*, dimensions, viii 391; trials, xi 326, xii 246; speed, xi 1103; *Proserpine*, des., vii 419; note, vii 815; launch, ix 168; coal consumption, x 858; trials, xi 243, 326; *Psyche*, des., i 358; ordered, ix 864; launch, x 860; trials, xi 326, xii 246; *Priamus*, trials, xi 326; *Pyramus*, dimensions, viii 391; trials ..... xii 246
Quail, launch, vii 820; launch and trials, ix 172; *Queen*, data, xiv 321; launch and des., xiv 652; data, xiv 962; trials ..... xvi 258, 340
Racehorse, launch, xiii 282; trials, xiv 208; *Racoon*, des., i 171, 266; *Rainbow*, des. and trial, v 211; *Ramillies*, contract, des. and launch, iv 306; details, v 226; trials, v 515, vi 182; contract trial, v 739; trials, gunnery, v 1041; compared to *Charles Martel*, Fr., x 1198; *Ranger*, trials, viii 397; *Rattlesnake*, des., i 171, 265; *Recruit*, vii 820; launch, viii 841; trials xiii 271; *Renard*, details, v 226; trial, v 1061; des. and trial, vi 200; *Renown*, des., v 487, 515, viii 163; launch and des., vii 427; trials, viii 387, xi 318; boiler weights, viii 641; *Repulse*, details, v 226; contract trials, v 512; trials, vi 182; *Resolution*, trial, v 1039, vi 182; evaporator explosion, vi 168; des., vi 188; behavior at sea, vi 188, 482; *Retribution*, trials and des., v 211; *Revenge*, launch and des., v 223; details, v 226; ordnance trials, vi 168; trials, vi 182; des., vi 188; rolling experiments, vii 541; coal consumption, xiii 1029, 1031, 1032; *Rinaldo*, trials, xiv 206; speed, xiv 321; *Ringdove*, trial, ii 422; *Rocket*, launch, vi 805; trials, vii 423; machinery and trials, breakdown, viii 175, 179; breakdown, viii 621; *Rodney*, des., i 170, 265; *Roebuck*, trials, xiv 208; *Rosario*, dimensions, ix 804; trials, xii 565, xiii 274; *Roxburgh*, combination boilers, Dürr and cylindri-

Naval Vessels, British.
cal, xiv 921; launch and des., xvi 344; *Royal Arthur*, des., iii 263; coal consumption, vii 347; Callao to Coquimbo, xii 736; *Royal Oak*, launch and des., v 221; details, v 226; trials, vi 182; des., vi 184; *Royal Sovereign*, des., iii 261; des. and trials, iv 295; trials, vi 182; rolling of, vi 476; performances under steam, vi 489; coal consumption, vii 347; machinery data, xi 330; *Royal Sovereign* class, qualities and performance, vi 464; rolling experiments, vii 538; royal yacht, new, x 231; *Ruby*, des., i 266; *Rupert*, i 265; *Russell*, launch and des, xiii 476; trials.....xiv 657, 963
St. George, details, iii 134, v 226; trial and des., vi 198; overhaul of, xvi 690; *Salamander*, boiler change, viii 620; *Salmon*, trials, vii 817; machinery, viii 844; repairs, xiv 564; *Sandfly*, bad seagoing qualities, i 89; trials, i 179; des., i 171, 265; repairs to, iii 599; *Sanspareil*, i 84; repairs, vi 197; coal consumption, vii 347; xiii 1029, 1031, 1032; *Sapphire*, launch and des., xvi 687; reciprocating engines, compared with *Amethyst*, turbines, xvi 1242; *Sappho*, des. and trials, iv 830, v 218; *Scylla*, des. and trials, v 218; *Seagull*, accident to, iii 457; boilers, viii 172; trials, ii 234, xii 246, 562, xiv 964; horsepower, xii 252; boilers, xvi 920; *Seal*, launch, ix 421; trials, x 237; sea-speed trials of the Mediterranean squadron, xiii 276; *Sentinel*, launch and des., xvi 686; *Serpent*, des., i 171, 265; *Shannon*, des., i 265; *Shark*, preliminary trial, vii 170; trials, vii 423; machinery and trials, viii 175; *Sharpshooter*, trials, i 262; vii 822; des., i 265; trial-failure, i 357; defects in 1892 maneuvers, iv 838; repairs, vi 200; Belleville boilers, v 1031, vi 414; boiler trials, vi 591, vii 601; data, vi 804; Belleville boiler trial, viii 379; *Sharpshooter* class, *Sheldrake*, *Skipjack*, *Spanker*, *Speedwell*, trials and defects, ii 234; *Shearwater*, xii 563; trials, xiii 283; *Sheikh*, speed, x 230; *Sheldrake*, changes in, ii 234; trials, xi 250, 1104; boilers, xvi 920; shipbuilding program for British Navy, 1893, v 486; shipbuilding program 1895, vii 145; British shipbuilding 1900, xii 559; *Sirius*, performance data, iii 597, vii 363; *Skate*, repairs, viii 620; *Skipjack*, changes in, ii 234; trials, xii 246; *Slaney*, des., i 266; *Snapper*, machinery, viii 844; *Spanker*, changes in, ii 234; trial, ii 582; defects in 1892 maneuvers, iv 838; new boilers, vii 821; trial, viii 392, 835; *Sparrowhawk*, launch, vii 820; trials, viii 842; correction of data, ix 173; loss of, xvi 1327; *Spartan*, des. and trials, iv 300; *Spartiate*, des., viii 827; trials, xii 1103, xiv 965; note, xiii 283; boiler results, xvi 524; *Speedwell*, changes in, ii 234; trials, xiii 274; *Speedy*, speed of, iv 302; launch and des., v 684; trial, v 1060, vi 350, 427, vii 416; des. and trials, vi 199; *Spey*, des., i 267; *Spider*, des., i 171, 265; trials, i 179; *Spitfire*, speed, viii 843; machinery, ix 168; full-power trials, ix 690; *Spiteful*, trials, xii 245; oil-fuel trials, xvi 1328; *Sprightly*, speed, xiii 776; trials, xiv 208; *Stag*, trials, xiii 271; *Star*, launch, viii 841; trials, ix 418; preliminary trial, x 230; *Starfish*, trials, vii 818; *Sturgeon*, data, vii 425; speed, vii 602; note, vii 822; *Sturgeon* class, machinery data, viii 568; submarines, des., xiii 492; launch, xiii 1113, xvi 691; new, xvi 1328; *Submarine A-1*, foundering of, xvi 691; refloating of, xvi

Naval Vessels, British.
1008; *No. 2*, test, xiv 966; *No. 5*, launch, xiv 966; *Success*, speed, xiv 658; *Suffolk*, trials, xvi 258; *Sultan*, refitting, vii 600; *Sunderland*, des. and trials, ii 244; *Sunfish*, speed, vii 822; trial, viii 181; *Surly*, trials, vii 423; machinery and trials, viii 175; oil fuel, x 863, xiv 1229; *Surprise*, des., vi 205; *Sutlej*, trials, xiii 490, 776, xiv 206; *Swiftsure*, trials, xvi 682; *Swordfish*, des. and trial, viii 618; trials, viii 843; machinery, ix 168; full-power trials, ix 691; *Sybille*, work on, ii 421; trials, iv 304; machinery test, v 519; wreck, xiii 491; *Sylvia*, speed, x 660; *Syren*, trial.....xiii 1112, xiv 208, 322
Talbot, data, v 516; launch and des., vii 427; trials, viii 616, xi 324; *Tartar*, des., i 266; *Teal*, des., xiii 777; *Teazer*, machinery, viii 621; *Tees*, i 267; *Temeraire*, new boilers, iv 837; *Terrible*, note on, v 516; des., vi 197; launch and des., vii 584; comparison with new cruisers, viii 557; preliminary trials, viii 613; trials, viii 811, ix 153, x 562, 1180, xi 322, xiv 298; run, x 866; compared to *Jeanne de Arc*, Fr., xi 797; runs compared with *Powerful*, xii 737; data compared with protected cruisers, xii 1015; overhaul of, xvi 690; boilers, xvi 1293; *Teviot*, trials, xvi 259; *Thames*, des., i 170, 265; *Theseus*, details, v 226; des., iii 134, v 1049; trials, vi 198; *Thetis*, performance data, iii 597; *Thistle*, ix 804; des., x 1186; trials, xi 1106, xii 246; *Thorn*, trials, xiii 271; *Thrasher*, vii 820; launch, viii 181; trials, ix 172; groundling, ix 807, x 232; *Thunderer*, defects in boilers, iv 280; ferruled boiler tubes, iv 837; trial, v 453; gun accident, xiii 283; *Tiger*, trials, xiii 271; *Topaze*, des., xvi 361; laid down, xvi 688; reciprocating engines compared with *Amethyst* turbines, xvi 1242; *Torch*, des., v 518, vi 203; trials, vii 601; coal consumption, viii 172; torpedo boat: *No. 25*, boiler defects in 1892 maneuvers, iv 838; *Nos. 42* and *61*, bad seagoing qualities, i 90; *Nos. 52, 53, 55*, reboilering, xiv 1250; *No. 75*, sunk in 1892 maneuvers, iv 838; *Nos. 91, 92, 93, 97*, dimensions, vi 615; *Nos. 94* and *95*, speed, vi 805; *No. 98*, launch, xiii 492; speed, xiii 779; *No. 99*, speed, xiii 779; *No. 107*, speed, xiv 323; *No. 108*, trials, xiv 321, *No. 109*, launch, xiv 960; *No. 110*, launch, xiv 1250; *Nos. 109, 110, 111, 112, 113*, trials, xvi 259; speed of building, iv 117; new, 1892, des. and comparison with former types, iv 834; 1898, trials, xi 253; torpedo-boat destroyers, trials, xiv 46; thirty-knot, vii 820; five ordered, viii 186; six ordered, viii 401; eighteen ordered, viii 622; thirty-two-knot, two ordered, viii 401; torpedo flotilla, 1893, v 517; torpedo gunboat first class, des., iii 598; *Dryad*, *Hazard*, iv 301; *Rattlesnake*, *Grasshopper*, *Sandfly*, *Spider*, *Sharpshooter*, *Spanker*, *Boomerang*, *Karakatta*, *Salamander*, *Seagull*, *Sheldrake*, *Assaye*, *Plassy*, *Skipjack*, *Speedwell*, *Alarm*, *Circe*, *Gleaner*, *Gossamer*, *Hebe*, *Leda*, *Antelope*, *Jaseur*, *Jason*, *Niger*, *Onyx*, *Renard*, *Dryad*, *Halcyon*, *Hazard*, *Hussar*, *Speedy*, vii 358; *Trafalgar*, des. and trials, i 254; power and speed, vi 491; coal consumption, xiii 1029, 1031, 1032; *Trent*, des., i 266; *Tribune*, launch and des., iii 264; performance data, iii 597; *Triumph*, floating base for destroyers, xiv 1253; des. and trials, xvi 265; turbines, steam, *Amethyst*, compared with *Topaze*, *Sapphire* and *Diamond*, reciprocating engines.....xvi 1242

Naval Vessels, British.
Undaunted, des., i 265; trial, ii 235; *Urk*, trials.....xvi 259, 690
Velox, trials, xvi 259; *Vengeance*, note, ix 602, 802; des., xi 783; trials, xiii 779, 1107, xiv 206; *Venerable*, launch and des., xi 1101; trials, xiv 966; *Venus*, launch, vii 815; trials, viii 830, x 230, xi 830; machinery data, xi 330; *Vestal*, xii 563; trials, xiii 274, 284; speed, xiv 320; *Victoria*, trials, i 84; sinking of, v 693, vi 47; *Victoria and Albert*, trials, xiii 274; *Victorious*, des., vi 423; launch and des., vii 813; trials, viii 808, xi 318; *Vigilant*, trials, xiii 271; accident to, xvi 692; *Vindictive*, des., vii 419; boilers and armament, viii 170; trials, xi 243; *Violet*, speed, ix 808, x 231; coal consumption, x 571; *Viper*, data, xi 1104, xii 1103; speed, xii 244; trials, xii 565, xiii 284, 780; turbine installation, xiii 143; *Virago*, vii 820; launch, viii 181; trials, ix 171; *Vixen*, machinery space, xiii 867; trials, xiv 208; *Volage*, des., i 173, 266; *Vulcan*, repair ship, vii 75; des., iii 460, iv 820; trial, iii 599; repairs to, iv 118; boilers, defects in, iv 280; boiler data, iv 507; ferruled boiler tubes, iv 837; trials, v 514; *Vulcan* class, characteristics, iii 142; *Vulture*, data.....vii 820
Walleroo, trial, iii 129; warship building in 1901, xiv 196; warships, trials, conditions of, xvi 1286; *Warspite*, des., i 172, 265; *Watchful*, des., i 267; *Welland*, launch, xvi 691; des., xvi 1005; *Whiting*, des., i 358; launch, viii 841; speed, ix 420; *Wigeon*, trials, ii 235, xvi 688; *Wizard*, des., i 358; machinery, viii 621; speed, x 864; *Wolf*, coal consumption, x 240; trials, x 572; *Woodlark*, trials, x 563; Yarrow boilers in.....xv 838
Zebra, launch, viii 181; machinery, viii 621; *Zephyr*, trials.....xiii 271
Naval vessels, Chili.
Almirante Condel, des., ii 585; *Almirante Lynch*, launch and des., ii 237, des., ii 585; *Almirante Simpson*, launch, viii 386; speed.....viii 611
Blanco Encalada, bids for raising, iv 102; des., vi 602, vii 154; data compared with protected cruisers.....xii 1015
Capitan Muniz Gamero, launch, viii 386; speed, viii 807; *Capitan Orella*, launch, viii 386; note, viii 807; *Capitan Prat*, des., iii 287, iv 128; trial, v 231; voyage from Toulon to Talcahuano, v 1066; *Chacabuco*, purchase, xiv 618; *Cirujano Videla*, note, ix 406; *Congreso*, data.....ix 406
Destroyers, ordered.....vii 811
Esmeralda, launch, viii 385; data, ix 142; compared to *Kléber*.....xiv 1255
General Baquedano, launch, x 840; *Guardia Marine Riquelme*, launch, viii 611; trials.....ix 143
Injeniero Hyatt, speed, ix 406; data.....ix 797
Libertad, now *Triumph*, Br., des. and trial.....xvi 265
Ministro Zentano, launch, viii 385; note.....ix 143
Niclausse boiler installations.....xv 1173
O'Higgins, data, ix 143; des.....x 838
Presidente Errazuriz, des. and trials, iv 528; *Presidente Pinto*, des., iii 607, iv 528
Teniente Serrano, launch, viii 611; trials, ix 143; torpedo boats, 1896, viii 611; launch, ix 144; Yarrow boilers in.....xv 838

Naval Vessels, China.
Chi Yüen, mention in battle of Yalu, viii 370; cruisers, 1896.....viii 612
Destroyers (four), 1899.....xi 238
Fei Ying, launch, vii 811; des.....viii 162
Hai-Chai, launch, x 225; *Hai-Tien*, launch, x 224; *Hai Yung*, launch.....ix 798
Torpedo boats (two), voyage to Nanking, viii 162; torpedo cruisers..ix 145
Naval vessels, Denmark.
Geiser, Thornycroft boilers, ii 237, v 163; des., v 163; boiler weights, v 169
Hagen, note, viii 612; *Hecla*, test of cellulose, iii 466; *Heimdal*, launch, vi 800; *Herluf Tralle*, note, ix 145; launch, xi 1097; data.....xiii 476
Moen, wreck.....xiii 1082
Skjold, launch.....viii 612
Naval vessels, Egypt.
Sheikh, des., ix 798; *Sultan*, des.....ix 798
Naval vessels, France.
A3, dimensions, ix 175; *Amiral Aube*, data, xii 253, xiv 662; trials, xvi 350; boiler trials, xvi 460; *Amiral Cécile*, trials, i 180; *Amiral Duperré*, repairs, xiii 288; *Amiral de Gueydon*, des. x 573; note, ix 810; launch and data, xi 1108; preliminary trials and mishap, xiv 1254; *Amiral Pothuau*, launch and des., viii 848; trials, ix 424; *Amiral Trehourt*, des., viii 403; speed, viii 625; *Alger*, characteristics, iii 142; *Aquilon*, des., viii 191; trials, viii 405; *Arèthuse*, steam-pipe explosion, vi 785; *Argonaute*, trials, vi 619; *Ariel*, comparative data, ix 35; armored cruisers, ii 235; *Audacieux*, launch, xii 1107; *Avant Guarde*, coal consumption, iii 273; comparative data, ix 35
Baliste, trials, xvi 700, 1011; *Balny*, comparative data, ix 35; *Bélier*, note, xiv 329; *Bouet Willaumez*, wreck of, xii 1107; *Bourrasque*, speed, xiv 325; des., xiv 663; *Bouvet*, launch and des., viii 623; dimensions, x 879; *Bouvines*, des., ii 235; trials, vii 402, 604; speed, viii 403; *Brennus*, launch and des., iii 601; des., vi 806; trials, viii 186; *Bruix*, des., ii 235, 422, iv 841; note, ix 177; *Bugeaud*, des., iv 519; launch, v 1064; Belleville boiler, vii 408; trials.....viii 404
C3, dimensions, ix 175; *Carnot*, launch and des., vi 618; des., vii 305, viii 401; speed, viii 625; trials, ix 174; *Casabianca*, des., vi 206; speed, viii 405; *Cassard*, dimensions, vi 204; launch, viii 626; speed, ix 813; *Cassini*, des., iv 312; preliminary trials, vii 430; breakdown, viii 191; trials, viii 405; *Catinat*, des., vi 205; launch, viii 849; trials, x 577; *Cecille*, trials, i 180, iii 135; defects in, iv 314; performance data, v 504; *Chanzy*, des., ii 235, 422, iv 841; *Charlemagne*, des., vi 427; launch, vii 823; speed, x 577; trials, x 875; comparative trials, xii 254; repairs, xiii 288; *Charles Martel*, launch, v 1063; preliminary trials, viii 847; boiler tubes, ix 422; compared to *Ramillies*, Br., x 1198; *Charner*, des., ii 235, 422, iv 841; characteristics, iii 142; *Chasseloup-Laubat*, D'Allest boiler, vii 408; trials, vii 429; *Chateaurenault*, note, vii 825, xiii 781; launch, x 578; launch and des., x 879; Normand-Sigaudy boilers, xii 569; speed, xii 1105, xiv 967; trials, xiii 1092, xiv 664; final trials, xiv 1253; *Chevalier*, des. and trials, vi 585; com-

Naval Vessels, France.
parative data, ix 35; *Coetlogon*, speed, iii 601, vi 618; *Comeur*, iii 603; *Condé*, data, xiii 497; launch, xiv 663; trials, xvi 1010; defects, xvi 698; *Corsaire*, ordered, iv 520; *Cosmao*, speed, iii 601; *Courbet*, des., xiv 664; cruisers, third-class, iii 600; cruisers of the Mediterranean squadron, defects in, iv 313; *Cyclone*, note.....viii 850
D2, *D3*, dimensions, ix 176; *Dard*, trials, xvi 700; *D'Assas*, dimensions, vi 204; launch, viii 404; data, ix 425; trials, x 575; repairs, x 886; *Davoust*, characteristics, iii 142; *Davout*, compared to *Suchet*, iii 272; repairs to, iii 600; defects in, iv 314; *Decidé*, data, ix 810; trials, xii 839; *De Gueydon*, data, xi 252; *Democratie*, work on, xvi 348; launch and des., xvi 695; *D'Entrecasteaux*, des., v 751; launch, viii 626; des. and trials, x 885; *Desaix*, dimensions, x 886; launch and data, xiii 497; trials, xvi 351; *Descartes*, des., iv 843, v 519; launch and des., vi 805; trial, viii 626; alterations, viii 849; *D'Estrées*, boilers, viii 190; *D'Iberville*, launch, v 1063; des. and trials, vi 806; *Dragon*, launch, iv 520; *Du Chayla*, v 204; dimensions, vi 204; launch, viii 188; preliminary trial, ix 812; dimensions, x 261; *Dunois*, dimensions, viii 190; data, ix 813; *Dupetit-Thouars*, des., ix 809, x 870, xvi 1330; data, xi 252; launch, xiii 781; *Dupleix*, des., x 574; engines, x 886; note, xiv 666; *Dupuy de Lôme*, characteristics, iii 142; triple screws, iv 289; trial and des., iv 516; compared with British cruisers, iv 839; boiler accident, v 1061; trials, vii 429; defective boilers, xiv 325; new boilers, xvi 350; *Durandal*, note, viii 850; outboard- vs. inboard-turning propellers.....xv 1183
Eclair, des., iv 127; *Edgard Quinet*, des., xvi 1329; *Epée*, speed, xiii 499; inboard- vs. outboard-turning propellers, xv 1183; *Ernest Renan*, see *Renan; Escopette*, data, xi 800; *Espadon*, launch, xiii 1095; *Espiégle*, des.....vii 173
Fauconneau, des., x 261; speed, xii 839; *Flamberge*, data, xi 800; *Fleurus*, launch, v 520; repairs, vii 173; new boilers, viii 626; note, ix 425; *Flibustier*, trials, vii 430; des., vii 825; *Forban*, des., vi 429; launch, des. and trial, vii 825; comparative data, ix 35; *Forbin*, trials, i 180, 360; speed, iii 601; defects in, iv 315; performance data, v 504; *Foudre*, vii 76; torpedo depot ship, des., iv 126; launch, vii 824; note, viii 403, xvi 699; trials, ix 176; *Framée*, sinking of, xii 1106; contracts with private builders for machinery for naval vessels, iv 480; instructions for determining coal consumption, ii 406; new construction, xvi 348; program, 1892, iv 311; 1894, v 749; 1897, ix 130; 1905, xvi 1009; *Friant*, preliminary trial, vi 807; trials, vii 171; Niclausse boiler, vii 408, viii 375; official trials.....vii 429
G14, data, xiii 1093; *Galilée*, launch and dimensions, viii 405; data, viii 627; *Gaulois*, launch, viii 848; trials, x 877; comparative trials, xii 254; *Gloire*, launch, xii 838; and *Condé*, trials, xvi 354; *Goubet*, data, xii 254; *Gueydon*, des., x 870; *Guichen*, note, vii 825; note, x 884; speed, xii 253, xiv, 667; *Gustave Zédé*, accumulator accident, vi 619; note.....xiii 289
Hallebarde, note, viii 850; outboard- vs. inboard-turning propellers,

Naval Vessels, France.
xv 1183; *Henri IV*, des., vi 427; dimensions, viii 187; data, xi 800; des., xiv 667; *Hoche*, trials, iii 269, xii 1105; des., iii 602; alterations, vii 428; boiler trials.....xii 839
Indomptable, reconstruction, xiv 325; *Infernet*, des. viii 190; launch, xi 1107; *Isly*, characteristics, iii 142; launch, iii 603; boiler trials, xvi 458
Jauréguiberry, des., iii 279; contract for, iii 603; launch and des., v 1064; des., vi 616; preliminary trials, viii 403; trials, viii 624, ix 421; *Jean Bart*, characteristics, iii 142; defects in, iv 314; Niclausse boilers, xiv 325; boiler trials, xvi 458; *Jeanne d'Arc*, dimensions, viii 188; des., x 864, xi 797; Normand-Sigaudy boilers, xii 569; defects, xiii 78; note, xiii 1092; data, xiv 668; defects, xvi 352; trials, xvi 699; *Jemmapes*, des., ii 235; trials, vi 805, vii 402; *Jena*, dimensions, ix 424; launch and des., x 1198; commissioned, xii 253; trials, xiii 498, 1092; speed, xiii 781; *Jules Ferry*, data, xii 839; *Jules Michelet*, data, xiv 668; Du Temple-Guyot boilers, xvi 352; laying down of, xvi 698; *Jurien-de-la-Gravière*, note, vii 825, viii 190; launch, xi 801; des., xiv 325; Du Temple-Guyot boilers, xiv 669; trials, xiv 967; defects, xvi 253; *Justice*, des. .....xvi 353
K2, data, ix 178; *K3*, viii 190; *Kabyle*, des., iv 127; *Kersaint*, dimensions, viii 191; launch, ix 810; *Kléber*, engines, xiii 289; launch and data, compared to *Bayan*, *E*, *Esmeralda*, *Garibaldi*, xiv 1255; trials.....xvi 349
La Cecille, des., iii 135; *La Hire*, dimensions, viii 190; Normand-Sigaudy boilers, xii 569; *Lalande*, speed, iii 601; *Lancier*, comparative data, ix 35; *Lansquenet*, des., vi 206; data, vi 807; trials, vii 430; *Latouche-Treville*, des., ii 235, 422, iv 841; trials, vii 172, 429; *Lavoisier*, trials, x 574; *La Zélée*, dimensions, x 887; *Leger*, launch and des., iii 603; *Leon Gambetta*, data, xii 839; launch, xiii 1090, xiv 328; ready for trial, xvi 349; trials, xvi 696, 1330; *Levrier*, torpedo scout, trials, iv 845; *Linois*, des., iv 842; *Ludion*, data, xiii 781; *Lynx*, data.....xiii 781
M2, data, ix 178; *Masséna*, des., iv 315, ix 423; launch and des., vii 603; preliminary trials, x 576; trials, x 878; *Mangini*, speed, ix 178; *Marceau*, des. and trial, iii 273; *Marseilles*, mishap, xiv 1254; *Marseillaise*, boiler trials, xvi 490; trials xvi 349; *Michelet*, named, xiv 669; *Milan*, defects in, iv 315; *Mistral*, launch, xiii 782; trials; xiii 1095; *Montcalm*, des., x 870, xiii 290; data, xi 252; launch and des., xii 568; trials, xiii 1091, xiv 329; compared to *Prinz Heinrich*, xiv 334; speed, xiv 669; Normand-Sigaudy boilers, xiv 968; *Morse*, data, xii 568, xiii 291; *Mousquetaire*, des., iii 604; *Mousqueton*, trials.....xvi 349
Naiade, data, xiii 781; *Narval*, data, xiii 291; *Neptune*, note, xiii 292; Niclausse boiler installations, xv 1172; *No. 128*, comparative data, ix 35; *No. 149*, comparative data, ix 35; *No. 183*, comparative data, ix 35; *Nos. 278* to *294*, des., xvi 700; *No. 281*, trials, xvi 1015; *No. 283*, trials, xvi 1330; *No. 285*, launch, xvi 1015; *No. 293*, trials...xvi 1011
Orage, des.....iv 127
P35, *P36*, data; ix 178; *Pascal*, coal consumption, viii 849; dimensions, viii 189; trials, ix 177; *Patrie*, des., xvi 353; *Pertuisane*, data, xi

Naval Vessels, France.
800; *Pique*, data, xiii 499; lack of stability, xiv 336; inboard- vs. outboard-turning propellers, xv 1183; *Pistolet*, note, xiv 329; *Pothuau*, iv 841 (see *Amiral Pothuau*); *Protée*, data, xiii 781; *Protet*, dimensions, viii 189; data.....xiv 357
Rafale, des., xiv 663; rapid cruisers *Nos. 1* and *2*, des., vii 602; *Rapière*, data, xi 800; *Renan*, (*Ernest*) named, xiv 669; *République*, launch, xvi 348; *Requin*, data, xiv 330; reconstruction, xiv 669; recent trials of cruisers, 1895.....vii 150
Sabre, trials, xvi 1011; *Saint Louis*, des., vi 427; launch and dimensions, viii 847; note, xiii 292; *Sarrasin*, boiler explosion, vi 166; *Sfax*, defects in, iv 315; shipbuilding program, 1893, iv 521; *Silure*, submerged 140 ft., xiv 609; mishap, xiv 968; *Sirene*, trials, xiii 1094; *Siroco*, data, xiii 782; trials, xiii 1093, 1095; submarines (six), 1899, xi 254; *Sirene*, *Triton*, *Espadon*, *Silure*, data, xiv 330; *Suchet*, trials, vi 428; speed and dimensions, x 576; boiler trials, xvi 458; *Suffren*, data, x 874, xi 1106, xiv 332; Niclausse boilers, x 1202; xi 800; des., xiv 968; trials, xvi 352; success of Niclausse boilers, xvi 699; *Sully*, boiler trials, xvi 460; *Surcouf*, speed, iii 601; performance data, v 504; *Surprise*, note, vi 205; trials.....viii 405
Ti, data, ix 178; *Tage*, des., iii 462; defects in, iv 313; *Tartare*, paddle steamer, trials, iv 580; *Thenard*, contract for, viii 192; torpedo boats *Nos. 126*, *127*, *128*, trial and coal consumption, iii 273; *No. 140*, boilers, iv 491; *No. 155*, des., iv 316; *Nos. 182* to *191*, des., iv 843; *Nos. 201*, *202*, *203*, des., ix 811; *No. 223*, launch, xiv 669; *Nos. 230*, *231*, *232*, data, ix 813; *No. 245*, data, xiii 499; *Nos. 254* and *256*, data, xiv 332; defects in, i 184; torpedo depôt ship *Foudre*, (see *Foudre*); *Tourmente*, trial, vi 619; *Trehouart*, des., ii 422; launch, v 750; name changed to *Amiral Trehouart*, viii 403; *Triton*, data, xiii 1094; boiler accident, xiv 968; *Trombe*, grounding, xiii 293; trials, xiii 1095; *Troude*, des., iii 270; speed, iii 601; tubulous boilers, vii 365; turbines for experiment, torpedo boats, xvi 1330; *Typhon*, launch, xiii 782; speed.....xiv 332
Valmy, des., ii 235; *Vautour*, trials, ii 236; *Victor Hugo*, compared to *King Alfred*, Br., xiv 314; work on, xvi 351; launch.....xvi 697
Warship building in 1895, vii 146; *Wattignies*, launch, iii 280; trials, iv 844
Zélée, trials, xii 839; *Zouave*, trials.....iv 527
Naval vessels, Germany.
Aegir, des., vii 604; electricity for all auxiliaries, viii 550; data and trials, ix 813; coal-consumption and boiler data, Thornycroft, xiv 117; rebuilt, xiv 972; *Amazone*, launch, xiii 293; *Arcona*, trials, xvi 358; *Ariadne*, trials, ...xiii 782, xiv 333
Baden, data compared with triple screw, xiii 404; Dürr boilers, xiii 887, 901; xiv 117; rod pressure, xiv 21; cylinder data, xiv 37; coal-consumption and boiler data, Dürr, xiv 117; *Bayern*, reconstruction, v 1077; speed, xi 255; Dürr boilers, xiii 888, 901, xiv 117; rod pressure, xiv 21; cylinder data, xiv 37; coal-consumption and boiler, Dürr, data, xiv 117; *Beowulf*, repairs, xii 570, coal-consumption and

Naval Vessels, Germany.
boiler data, xiv 116; *Berlin*, progress on, xvi 357; boilers used in, viii 553; *Brandenberg*, boiler accident, vi 416; data, compared with triple screw, xiii 404; coal-consumption and boiler data, xiv 116; *Bremen*, progress on, xvi 357; *Buzzard*, coal-consumption and boiler data.....xiv 116
Coal-consumption data, xiv 116; *Condor*, coal-consumption and boiler data, xiv 116; *Cormoran*, coal-consumption and boiler data, xiv 116; cruiser *A*, data, xi 1110; cruiser, *B*, Dürr boilers, xiii 897; cruisers, second class, 5,900 tons, 1898.....x 578
Destroyer, 1898, x 579; *No. 107*, speed.....xiv 676
Electricity for auxiliaries.....viii 550
F, launch, vi 808; *Frauenlob*, data, xiv 674; trials, xvi 358; *Freya*, dimensions, vii 828; triple screws, details, viii 551, 556; boilers, ix 815; speed, xi 255; note, xi 1110; speed trials, xiii 294; trials and boilers, xiii 500, 501; coal-consumption and boiler data, Niclausse, xiv 117; *Friedrich der Grosse*, triple screws, viii 551; *Friesland*, launch, ix 182; *Frithjof*, launch, iii 605; coal consumption, boiler data, xiv 116; *Fürst Bismarck*, data, xiii 295; coal-consumption and boiler data, cylindrical, Schulz.....xiv 117
G 108, launch, xiii 1098; *G*, named *Frauenlob*, xiv 674; *G*, *H* and *I*, data, xiv 357; *Gazelle*, trials, xiii 294; boilers, xiii 501; coal-consumption and boiler, Niclausse, data, xiv 117; data, xiv 332; *Geier*, speed, viii 192; des. and trials, viii 631; coal-consumption and boiler data, xiv 116; *Gefion*, coal-consumption and boiler data, xiv 116; gunboats, (two) 1898, 895 tons.....x 579
H, launch, xiv 675; *Hagen*, repairs, xii 570, xiii 295; coal-consumption and boiler data, xiv 116; *Hamburg*, progress on, xvi 357; comparison with *Amethyst* and *Topaze*, xvi 360; trials, xvi 1018; *Hansa*, coal-consumption and boiler, Belleville, data, xiv 117; *Heimdall*, coal-consumption and boiler data, xiv 116; *Hela*, des., ix 180; coal consumption and boiler data, xiv 116; *Herta*, launch, ix 426; *Hertha*, boilers, ix 815; rod pressure xiv 21; cylinder data, xiv 37; coal consumption and boiler, Belleville, data, xiv 117; *Hildebrand*, launch, iv 847; coal-consumption and boiler data, xvi 116; *Hohenzollern*, des., vii 431; coal-consumption and boiler data, xiv 116; *Holland*, launch.....ix 182
Iltis, rod pressure, xiv 21; cylinder data, xiv 37; coal-consumption and boiler, Thornycroft, data.....xiv 117
Jagd, coal-consumption and boiler data, xiv 116; *Jaguar*, coal-consumption and boiler, Thornycroft, data.....xiv 117
K, dimensions, vii 828; triple screws, viii 551; details, viii 556; and *L*, note, xiv 338; *Kaiser*, repair ship, xii 256; data, xiv 973; *Kaiser Barbarossa*, launch and des., xii 569; trials, xiii 783, xiv 333; *Kaiser Friedrich III*, launch, viii 627; guns, ix 179; trials, xi 255; triple-screw data, xiii 404; grounding, xiii 632; rod pressure, xiv 21; cylinder data, xiv 37; coal-consumption and boiler, cylindrical-Thornycroft, data, xiv 117; *Kaiser Karl der Grosse*, launch and des., xii 255; note, xiv 333; trials, xiv 675; *Kaiser Wilhelm II*, launch, ix

Naval Vessels, Germany.
813; coal-consumption and boiler, cylindrical-Schulz, data, xiv 117; *König Wilhelm*, compared to *King Alfred*, Br., xiv 314; data, xiv 334; *Kaiser Wilhelm der Grosse*, launch, xi 801, des, xiii 500; *Kaiserin Augusta*, des., iv 126; triple screws, iv 289, viii 550, xi 687; trials, iv 846; launch, viii 627; triple-screw data, viii 782; rod pressures, xiv 21; cylinder data, xiv 37; coal-consumption and boiler data, xiv 116; *Komet*, speed, vii 828; coal-consumption and boiler data, xiv 116; *Kurfurst Friedrich Wilhelm*, launch and des., iii 465; coal-consumption and boiler data.....xiv 116
L, dimensions, vii 828, triple screws, viii 551; details, viii 556; *Leipzig*, dimensions, vii 827; data, viii 406; triple screw, viii 551; details, viii 556; *Lothringen*, launch, xvi 1015; *Luchs*, coal-consumption, boiler, Thornycroft, data.....xiv 117
M, triple screw, viii 551; note, viii 631; boilers, ix 815; *Mechlenberg*, des. and trials, xvi 359; *Medusa*, launch, xiii 297; men-of-war, development in design and construction of, viii 543; *Merkur*, turbine installation, xv 603; *Meteor*, launch and des., ii 236; coal consumption and boiler data, xiv 116; launch, xvi 704; *München-Lubeck*, launch.....xvi 1017
N, triple screws, viii 551; note, viii 631; boilers, ix 815; *N* class, new battleships, xvi 1331; Niclausse boiler installations, xv 1173; *Niobe*, trials, xiii 297; coal-consumption and boiler, Thornycroft, data, xiv 117; *North Lyell*, rod pressure, xiv 21; cylinder data, xiv 37; *Nymphe*, launch, xii 256; speed, xiii 298; coal-consumption and boiler, Schulz, data.....xiv 117
Odin, des., ix 179; coal-consumption and boiler, data, xiv 116; omission of wood from design.....viii 551
Panther, trials, xiii 784; *Patrizia*, cylinder data, xiv 37; *Pelican*, coal-consumption and boiler data, xiv 116; *Preussen*, dimensions, vii 827; triple screws, viii 551; details, viii 556; launch, xvi 362; *Prinz Adalbert*, launch, xiii 784; compared to *Prinz Heinrich*, xiv 334; des., xvi 362; *Prinz Bismarck*, launch, ix 814; *Bismarck*, compared to *Prinz Heinrich*, xiv 334; *Prinz Friedrich Karl*, launch and dimensions, xiv 973; des., xvi 362; trials, xvi 704; *Prinz Heinrich*, des., xii 1107; Dürr boilers, xiii, 895, 901; compared to *Bismarck*, *Prinz Adalbert*, *Iwate*, *County* class, *St. Louis*, *Montcalm*, xiv 334; note, xiv 676; speed, xiv 974; trials.....xiv 1257
Rhein, Dürr boilers.....xiii 881
S26, capsized, ix 817; *Sachsen*, data compared with triple screw, xiii 404; Dürr boilers, xiii 901, xiv 117; coal-consumption and boiler, Dürr, data, xiv 117; *Schwaben*, launch, xiii 1095; des., xvi 359; ships, cost of construction, 1900, xii 840; shipbuilding, 1904, xvi 357; *Seigfried*, coal-consumption and boiler data, xiv 116; steam-pipe explosions, experiments to determine causes.....vii 737
Thetis, trials, xiv 333; *Tiger*, launch, xi 1110; coal-consumption and boiler, Thornycroft, data, xiv 117; torpedo boat, for China, xi 526; six, viii 850; six, 1898, x 579; *Nos. S108* to *S113*, data, xiii 501; *No. 108*, speed.....xiv 676

Naval Vessels, Germany.
Undine, progress.....xvi 357;
Ventilation, viii 549; *Victoria Luise*, launch and des., ix 425; boilers, ix 815; speed, xi 1110, xiii 298; Dürr boilers, xiii 891, xiv 117; rod pressure, xiv 21; cylinder data, xiv 37; coal-consumption and boiler, Dürr, data, xiv 117; *Vinela*, note, xi 1110; Dürr boilers, xiii 895, 901, xiv 117; rod pressure, xiv 21; cylinder data, xiv 37; coal consumption and boiler, Dürr, data, xiv 117; des.....xiv 212
Wacht, coal-consumption and boiler data, xiv 116; watertight compartments and doors, viii 549; *Weissenburg*, coal-consumption and boiler data, xiv 116; *Wettin*, launch and data, xiii 784; data, xiv 974; *Wittelsback*, des., xii 840; data, xiv 974; *Woerth*, launch and des., iv 846; trials, vi 808; engine data, vii 430; coal-consumption and boiler data, xiv 116; progress on, xvi 356; *Wurttemberg*, rod pressure, xiv 21; cylinder data, xiv 37; coal-consumption and boiler, Schulz, data.....xiv 117
York, launch.....xvi 1016
Zähringen, launch, xiii 785; des.....xiv 974, 975
Naval vessels, Greece.
Psara, des.....ix 427
Spetzia, trials.....iv 320
Naval vessels, Holland.
Friesland, trials, x 263; boilers, x 887; des., vii 829; Yarrow boilers..viii 406
Hertog Hendrik, Yarrow boilers, xiv 339; *Holland*, des., vii 829; Yarrow boilers, viii 406; boilers.....x 887
Ophir, data.....xiii 502
Pangrango, speed, xiii 502; oil fuel, xiii 786; *Piet Hein*, launch, vi 808; trial, viii 194; *Prinses Wilhelmina der Nederlanden*, des.....ii 426
Rindjani, trials.....xiii 785
Shipbuilding program, 1897.....ix 130
Yarrow boilers in.....xv 838
Zeeland, des., vii, 829; Yarrow boilers.....viii 406, x 887
Naval vessels, Italy.
Agordat, dimensions, viii 199; launch, xi 1111; trials, xiii 787, 1117; *America*, repair ship, vii 76; *Ammiraglio*, dimensions, x 1202; *Ammiraglio Saint Bon*, des., viii 196; data, xiii 788; trials, xiii 1118, xiv 339; *Ancona*, experiments on oil fuel, vi 282; *Andrea Doria*, trials, ii 423; *Aquila*, accident to, vii 605; *Aretusa*, launch, iii 283; des., vi 208
Benedetto Brin, dimensions, x 1202; launch.....xiv 341
Caprera, launch, vi 620; trials, vii 832; *Carlo Alberto*, launch, viii 414; launch and dimensions, viii 850; speed, x 892, xiv 979; *Castelfiardo*, experiments with oil fuel, iii 282; *Coatit*, dimensions, viii 199; *Condor*, progressive trials, xii 77; construction, 1904, xvi 362; cruisers, new, two, 1896.....viii 410
Delfino, trials.....xiii 1117
Elba, trials, vii 831; electricity in, xi 457; *Emmanuele Filiberto*, launch, ix 817; des., viii 196; des. and trials, xiii 502; data, xiii 1116; *Etruria*, trials.....viii 198

Naval Vessels, Italy.
Fieramosca, trials, ii 236; *Francesco Ferrucio*, data, xiv 341; launch, xiv 979; launch and data..... .....xiv 1260
Garibaldi, launch, ix 817, xi 802; speed, xiii 299; des., xiii 504; trials, xiv 340; Niclausse boiler trials, xiv 980; compared to *Kléber*, xiv 1255; *Governolo*, des.....vi 620
High-speed torpedo boats, Schichau .....iv 845
Italia, boilers.....xiv 676
Liguria, trials, viii 199; *Liguria* class, characteristics, iii 142; *Lombardia*, trials.....viii 198
Marco Polo, des. and trials.....viii 633
Napoli, des.. xvi 363; *Nembo*, launch, xiii 788; trials, xiv 341, 1260; Niclausse boiler installations.....xv 1172
Partenope, des., ii 423; *Piemonte*, des. and tials, i 180; trials, i 263; performance data, v 504; *Principessa Elena*, dimensions.....x 1202
Regina Elena, data, xiii 299; launch, xvi 704; *Regina Margherita*, launch and des., xiii 789; launch, xiii 1115; trials and des., xvi 1332; *Re Umberto*, trials, vi 207, viii 195; des... .....viii 410
Sardegna, trial, vi 620; des., vii 173; *Sicilia*, launch, iii 604; trials, viii 195; machinery, viii 410; combustion tester of.....viii 583
Torpedo boat, 1896, viii 635; *Turbine*, launch, xiv 343; trials, xiv 989, 1262
Umbria, speed, vi 620; trials, vi 809; data, viii 197; *Urania*, speed and dimensions.....iii 604
Varese, launch, ix 817; data, xii 1110; trials, xiii 299, xiv 340; boiler trials, Belleville, xiv 980; *Vittorio Emmanuele III*, data, xiii 299; launch, xvi 1326; *Vittor Pisani*, launch and des.....vii 830
Zeffiro, accident to.....xvi 1019
Naval vessels, Japan.
Adzuma, data, x 581; *Akagi*, mention in battle of Yalu, viii 372; *Akashi*, launch and des., x 267; data, xiv 357; *Akatsuki*, trials, xiv 343; *Akebono*, des., xi 803, xii 257; *Akitsushima*, data, xiv 345, xiv 357; *Asahi*, data, x 580; des. and trials, xii 571; *Asama*, des., x 579, xi 527; data, x 580; *Asashio*, launch, xiv 343; trial.....xiv 677
Battleships.....xi 258, xvi 363
Chishima-Kan, launch, iv 318; *Chitose*, launch and des., x 266; data, x 582; des., xi 256; *Chiyoda*, des., ii 428; cruisers, armored, 1897, des.....ix 182
Destroyers, 1897, ix 183.....xiv 677
Fuji, launch, viii 419; trials, ix 428; des., xiv 345; *Fuji Yama*, des.....vi 632
Hashidate, des., iv 316; mention in battle of Yalu, viii 370; *Hatsuse*, trials, xiii 301; des., xiv 345; *Hiyei*, mention in battle of Yalu....viii 372
Idzumo, launch and des., xi 1111; *Ikasuchi*, data, xi 259; des., xii 256; *Inadsuma*, des., xii 256; *Itsukushima*, work on, ii 426; trials, iii 145; des., iv 316; mention in battle of Yalu, viii 372; *Iwate*, launch and des., xii 574; compared to *Prinz Heinrich*.....xiv 334
Kasagi, launch and des., x 265; data, x 582; speed, x 892; *Kasuga*, purchase and des., xvi 364; *Kasumi*, trials, xiv 343; *Katori* and *Kashima*, new battleships.....xvi 702

Naval Vessels, Japan.
Matsushima, work on, ii 429; des., iv 316; mention in battle of Yalu, viii 372; *Mikasa*, des., xii 1110, xiv 344; *Murakumo*, data.....xi 260
Niclausse boiler installations, xv 1173; *Niitaka*, xiv 354, 357; *Niji*, des., xii 256; *Nisshin*, purchase and des.....xvi 364
Otawa, launch, xvi 366; *Ovoro*, des.....xii 257
Sazanami, des., xii 257; *Shikishima*, data, x 580; launch and des., x 1203; des., xi 1112, xiv 345; shipbuilding program, 1897, ix 133; *Shirakumo*, launch, xiii 1119; trials, xiv 358; note, xiv 678; *Suma*, data.....xiv 357
Table of fleet, xvi 314; *Takasago*, data, xiv 357; data, x 580; *Tatsuta*, des., vi 429; *Tokiwa*, data, x 580; launch and data, x 892; *Tsushima*, des., xiv 354, 357; trials.....xvi 704
Usugumo, des.....xii 259
Yakumo, data, x 581; dimensions, xi 1113; *Yashima*, launch and des., viii 414; trials and machinery, ix 818; *Yoshino*, launch and des., v 231; trial, v 1068, des.....xiv 345, 357
Naval vessels, Mexico.
Tampico, launch and des.....xiv 1262
Vera Cruz, launch and des.....xiv 1262
Naval vessels, Norway.
Coast-defense vessels (two).....viii 635
Delfin, dimensions.....ix 432
Hai, dimensions, ix 432; *Harold Haarfagre*, launch, ix 183; *Hval*, dimensions.....ix 432
Norge, launch.....xii 575
Submarines.....xiii 509
Tordenskjold, launch and des., ix 432; torpedo boats (three).....viii 200
Valkyrien, des., viii 851; Yarrow boilers in.....xv 838
Naval vessels, Portugal.
Adamastor, des., vii 606; launch.....viii 852
Cruisers, 1896, viii 420, 851; 1,770 tons.....ix 183
Dom Juan de Castro, note, ix 822; *Dom Carlos, I*, launch and dimensions, x 894; trials.....xi 538
Infante Dom Henrique, note.....ix 822
Niclausse boiler installations.....xv 1173
Rainha Amelia, trials.....xiii 790
Sao Gabriel, launch.....x 894
Tejo, launch, xiv 359; Yarrow boilers in.....xv 838
Naval vessels, Russia.
Adler, trials, ii 426; *Admiral Oushakoff*, launch, vi 210; des., vii 175; trials, vii 839; *Admiral Senjavin*, trials, ix 185; *Almaz*, des., xiii 1126; *Anakreon*, trials, ii 426; *Aran*, data, xiv 1269; *Askold*, launch, xii 575; data, xiii 302, 303, xiv 990; *Aurora*, des.....ix 823
Bayan, launch, xii 841; des., xii 1115; compared to *Kléber*, xiv 1255; speed, xiv 1265; *Bezuprechin*, launch, xiv 994; *Bogatyr*, data, xiii 303, xiv 991; des., xiii 511; battery, xiii 791; trial, xiv 682, 994; *Borodino*, data, xi 1115; *Boyarin*, launch, xiii 791, xiv 363; *Buistri*, speed.....xiv 1265

Naval Vessels, Russia.
Captain Sacken, boilers, new, x 582; *Cesarevich*, data, xii 261, 575; *Chesma*, repairs.....xiv 682
Destroyer, contract for, viii 200; *Diana*, note, viii 638; data, ix 188; des., ix 823; trials, xiv 683; *Delphin*, data.....xi 532
Ekaterina, repairs, xiv 682; electric launch, x 896; *Emperor Alexander III*, launch, xiii 1128; trials, xvi 367; des., xvi 1336; *Emperor Nicholas I*, des., ii 424; machinery ..... xiii 512
Filine, trials, xiv 683; *Forel*, speed.....xiii 793
Gagara, data, xiv 364; trials, xiv 683; *Gangut*, dimensions, iii 606; *General Admiral Apraxine*, dimensions, vii 839; launch, viii 637; *Georgei Pubeidonosets* (*George the Victorious*), des., iv 129; note, viii 420; des. and trials, viii 635; *Gilyak*, launch, ix 824; *Gremyastchy*, des., iii 605; *Gromoboi*, note, x 895; launch, xi 803; horsepower, xiii 304; compared to *King Alfred*, Br.....xiv 314
High-speed torpedo boats, Schichau.....iv 845
Izumrud, note, xiv 994; characteristics.....xvi 368
Jemtchug, note, xiv 994; *Johann Slatust*, characteristics.....xvi 368
Kassarsky, trial, ii 426, iii 281; comparison with *Geiser*, Den., in boiler weights, etc., v 170; *Kasatka*, data, xi 532; *Kefal*, data, xiii 304; speed, xiv 994; *Khivinetz*, characteristics, xvi 368; *Khrabry*, launch, viii 200; trials, ix 823; speed, x 582; *Kit*, data, xi 532; *Kniaz Potemkin Tavritchesky*, des., xiv 359; engine trial, xiv 682; data, xiv 994; trials.....xvi 368
Lossos, data, xiii 304; launch, xiv 682; speed.....xiv 995
Moskva, launch and des.....x 895
Navarino, work on, ii 425; des., iii 605; new cruiser, 1895, des., vii 607; new ships, 1899, xi 531; Niclausse boiler installations, xv 1172; *Novik*, data, xi 533, xiv 357, 366; des., xiii 1052; *Nyrok*, trials...xiv 684
Ochakov, des., xiii 1126; *Okean*, data, xiii 514; launch, xiv 683; *Orel*, trials, ii 237; launch, xiv 995; data, xiv 1265; *Oleg*, data, xiv 1265; *Osiotr*, data, xiii 304; *Osliabya*, dimensions, viii 200; data, ix 433; des., xvi 368; *Otvajny*, des.....iii 605
Pallada, note, viii 638; data, ix 188; des., ix 823; note, x 895; launch and dimensions, xi 1114; trials, xiv 684; *Paris*, des., vi 429; *Peresviet*, dimensions, viii 200; data, ix 433; launch, x 894; engine trials, xii 260; trials, xiii 305; des., xiii 1127; *Petropavlovsk*, launch and des., vii 174; *Pobieda*, data xi 534; des. and trials, xiv 685; engine room, xiv 995; *Poltava*, trial, x 1208; *Possadnik*, des., v 228; trials.....v 752
Retvizan, data, xi 534; des., xii 1114; launch and des., xiii 306; des. and trial, xiii 1121; *Rossia*, triple screws, vii 433; launch and des., viii 637; accident to, ix 186; floated after grounding, ix 433; trials, ix 822; *Rostislav*, launch and des., viii 853; *Ruric*, work on, ii 425; des., iii 605; des. and launch, v 228; des. and trials.....vii 433
Samoyede, des., vii 607; trials, vii 840; *Sevastapol*, horsepower, xii 260; data, xiii 307; *Sinope*, trial, ii 236, 424; *Sissoi Veliki*, des. and trials, ix 184; *Skat*, data, xi 532; *Smolensk*, launch and des. xiii 513; *Sokol*,

Naval Vessels, Russia.
des., vii 606, 833; *Som*, data, xi 533; trials, xii 576; *Standart*, des., vii 434; speed, ix 189; data, ix 436; *Stertiade*, speed, xiii 793; *Stremilelni*, speed, xiv 1265; *Svietlana*, named, viii 200; launch and des., ix 187; des.....x 269
Table of fleet, xvi 316; torpedo boats, trials, ii 426; 30-knot, viii 201; *Three Saints* (*Tri-Sviatitelia*), launch and des., vi 211; des. and trial, ix 188; training ship, xiii 304; *Tsarevitch*, data, xi 533, xiii 307; des.....xiii 509
Variag, launch, xi 1115; trials, xii 841, 1009; data, compared with protected cruisers, xii 1015; data, xiv 991; *Vierny*, launch, viii 200; *Voron*, speed.....xiv 685
Woewoda, des., v 228; trial.....v 752
Yastreb, trials, xiv 365; *Yenesei*, trials.....xiv 366
Naval vessels, Santo Domingo.
Independencia, launch.....vi 809
Restauracion, launch.....viii 386
Naval vessels, Hayti.
Crete-à-Pierrot, launch and des.....viii 193
Naval vessels, Spain.
Alfonzo XIII, characteristics, iii 142; *Almirante Oquendo*, des., vii 841; speed, viii 638; *Almirante Quendo*, characteristics, iii 142; *Audaz*, dimensions, ix 192; launch.....ix 438
Battleships and cruisers, 1896.....viii 853
Cardinal Jiminez de Cisneros, launch, ix 437; *Carlos V*, launch and des., vii 434, viii 200; *Cristobal Colon*, launch and des., viii 859.....x 586
Description and assignment of, iv 125; destroyers (two), contract for, viii 202; *Don Alvaro de Bazan*, launch and des., ix 825; *Dona Maria de Molina*, launch.....viii 855
Emperador Carlos V, i 360; des.....iii 606
Furor, launch, viii 856; trials.....ix 189
Isabel la Catolica, note, ix 824; *Infanta Maria Teresa*, i 360; launch and des., iii 138; des. and trials, v 960; des. and trial.....vi 621, 630
Lepanto, characteristics.....iii 142
Marques de la Victoria, launch.....ix 437
Niclausse boiler installations, xv 1172; *Nueva España*, des.....iii 606
Osado, dimensions, ix 192; launch.....ix 438
Pelayo, des. and trials, iii 283; boilers, x 582; *Pluton*, note, ix 438; launch, ix 825; trials, x 270; *Princesa de Asturias*, launch, viii 855; *Proserpina*, note, ix 438; launch.....x 270
Quiros, launch.....vii 435
Reina Regenta, performance data, v 504; *Rio de la Plata*, data.....ix 825
Shipbuilding, 1889.....i 360
Temerario, trials, iv 319; *Terror*, launch, viii 856; trials, ix 189; torpedo boats, viii 202; competitive speed trials.....i 181
Viscaya, i 360; des., iii 606; trials, vi 810; *Vitoria*, rebuilding.....x 591
Naval vessels, Sweden.
Aran, data.....xiv 691
Dristigheten, data, xi 1115; trials.....xiv 690

Naval Vessels, Sweden.
Göta, des., iii 139; reconstruction.....xiv 692
Mode, launch, xiv 996; trial.....xiv 1266
Njord, data.....ix 193
Odin, launch.....viii 420
Svea, reconstruction.....xiv 692
Tapperhetan, data, xiv 691; *Thor*, data, ix 193; *Thule*, launch and des., v 521; reconstruction.....xiv 692
Wasa, data, xiv 691; launch, xiv 367; Yarrow boilers in.....xv 838
Naval vessels, Turkey.
Abdul Hamid, data, xiv 997; trials, xvi 706; *Abdul Medjid*, data, xiv 997; *Ahter*, launch.....vi 810
Destroyers, Thornycroft, Barnaby.....vii 711
Medjidia, launch and des., xvi 705; *Mesoudieh*, reconstruction, xiii 1129; note.....xiv 997
Navy, v 232; Niclausse boiler installations.....xv 1173
Pelenk-i-deria, speed.....viii 856
Rehber, launch.....vi 810
Sed-ul-Bahr, launch, vi 810; *Seyd-i-Deriah*, launch, vi 810; *Shefket Numa*, launch.....vi 810
Torpedo boats, ii 113; des.....iii 284
Zuhaf.....vi 810
Naval vessels, U. S. of Colombia.
General Nerino, des., viii 202; gunboat.....vii 841
Naval vessels, miscellaneous subjects.
American and British compared, x 785; Armored cruisers, Br., compared with French, 1892, iv 838; aluminum torpedo boat, des. and trials.....vi 786
British and American, comparison of, x 785; battleships, recent first-class, qualities and performances of, vi 464; battleship designs, comparison of, xiv 248; boiler power compared in U. S. and British ships.....viii 30
Conversion and re-armament of ships, xiii 617; coal endurance affected by expenditures for auxiliaries, v 66; coal consumption in men-of-war, iv 109; central power plants vs. distribution of power.....x 95
Deterioration by corrosion, xiv 599; difficulties in use of oil fuel, xvi 863; distilling ship.....x 596
Electricity on, xi 411; electrical equipment of ships of war.....xii 797
Fast vessels for naval powers, iv 302; fast ships of various powers, 1891-1901, xiii 869; further experience with first-class battleships.—White.....vii 538
Logical arrangement of motive power of warships.....xi 641
Merchant steamers as auxiliaries, xiii 607; machinery, space occupied by, xiii 867; machinery weights, total per I.H.P.....ix 692
Niclausse boiler, trial data, various vessels.....xv 1171
Outboard- vs. inboard-turning propellers, x 485; outboard- and inboard-turning propellers, vessels named by Laubeuf, with each arrangement.....xv 1176

Naval Vessels, Miscellaneous Subjects.
Propeller data.—Dyson.....xv 332–349
Report on torpedo boats and destroyers.—Chandler-Linnard, xiv 282; relative warship strength,.....xvi 335
Speed trials.—Taylor, iv 587; screw propellers of, iv 157, 402; space occupied by machinery of new cruisers, 1889, i 249; speed trials of fast ships, ii 68; submarines, requirements, xiv 304; speed curves of ships building, iii 555; strength of torpedo boats, v 483; submarines, xvi 667
Torpedo boats, electrical propulsion for, x 958; transmission and distribution of power on modern ships, iv 173; Thornycroft torpedo boat trials, vi 590; torpedo boat trials, comment on speed results, xi 522; time required to construct, x 150; triple-screw ships.....xiii 397;
Triple screws: Advantages and disadvantages compared, viii 782; *Amiral Gueydon*, Fr., iv 810; arrangement advocated by Admiral Melville, xi 641; *Aurora*, Rus., ix 823; *Columbia*, xi 641; *Diana*, Rus., ix 823; direction of rotation of wing propellers, Fr., xv 1184; discussion, Melville, xiii 690; *Dupetit-Thouars*, Fr., ix 809; French and German, iv 289; *Freya*, Ger., viii 551, ix 815; *Friedrich der Grosse*, Ger., viii 551; *Hertha*, Ger., ix 815; *Jena*, Fr., ix 424, xiii 498; *K*, second-class cruiser, Ger., viii 551; *Kaiser Barbarossa*, Ger., xii 569; *Kaiser Friedrich III*, Ger., xiii 404; *Kaiserin Augusta*, Ger., viii 550; viii 782, xi 687; *Kaiser Wilhelm II*, Ger., ix 814; *L*, second-class cruiser, Ger., viii 551; *Leipzig*, Ger., viii 551; *M*, Ger., ix 815, viii 551; *Masséna*, Fr., ix 423; *Minneapolis*, xi 641; des. and trials, vi 702; *N*, Ger., ix 815, viii 551, *Osliabya*, Rus., ix 433; *Pallada*, Rus., ix 823; *Peresviet*, Rus., ix 433; *Preussen*, Ger., viii 551; *Prinz Bismarck*, Ger., ix 814; *Rossia*, Rus., ix 433, ix 822; *Victoria Luise*, Ger., ix 425, 815; *Vineta*, Ger., xiv 215; war steamers.....xi 191
Warships, cellulose, use of in, xiii 195; coaling of, xiii 1; cost of, England and France, xii 181; endurance of, practical and theoretical, iii 133; increase in size and speed of.....xi 910
Naval War College, lectures.—Hollis.....iv 637
Navarino, Rus., work on, ii 425; des.....iii 605
Navies, foreign, water-tube boilers.....xii 743
Navigation of shallow rivers, improvements in.....xiv 1029
Navires de Guerre.—Essai sur leur Valeur Militaire, book received.....ix 450
Navy, engineering in.....xv 808
Navy estimates, England, 1896–1897.....viii 377
Navy, Imperial Japanese.....xii 434
Navy regulation, circulars No. 52 and 53, examinations of engineer officers, i 93, 95; rescinded, replaced by Nos. 109 and 110, iv 462, 468; engineer division.....xvi 1195
Navy yards, electric transmission of power.....xiv 448, 814, 1109
Nebraska, characteristics, xii 810; evaporative test of Babcox & Wilcox boiler, xvi 133; boilers, performance data, xvi 153, 163; launch and des.....xvi 1309
Nebraskan, oil-burning steamer, xvi 708; oil fuel.....xvi 810

Necessity of engineer divisions in the naval militia.—Fry.....viii 303
Necochea, Arg. Rep., launch ..... ii 428
Nelson class, Br., battleships.....xvi 998
Nembo, It., launch; xiii 788; trials.....xiv 341, 1260
Nemesis, mer. str., trials.....vi 590
Neptune, Br., des.....i 265
Neptune, Fr., note.....xiii 292
Neptune, mer. str., des.....vi 640
Nernst electric lamp.....xi 215
Nero, data, x 824; steaming radius.....xiii 62
Nero, mer. str., Babcock & Wilcox boilers.....vi 395, viii 770
Net cost of warships in England and France.....xii 181
Nevada, launch, xii 1095; contract trial, xv 105; comparison of monitor performance.....xv 105
Nevadan, mer. str., launch, xiv 371; oil fuel.....xvi 810
New Alcyone, yacht, des.....vii 445
New alloys, chemical and physical aspect.....iii 489
Newark, authorization and data, i 236; machinery space, i 249; work on, ii 413; crank shafts, fitting up, iii 9; des. and trial, iii 99; power of auxiliary machinery, iii 217; engine and boiler data, iii 422; coal consumption, iv 110; propeller data, iv 158, 402; coal endurance, iv 666; air-pump data, vi 532; use of green wood for fuel, xii 100; inertia stresses of valve gear, xii 679; steaming radius.....xiii 62
New armored cruisers, Fr., 1892, discussed and compared with British..iv 838
New Atlantic coast steamers, 1898.....x 1210
New Atlantic liners, 1902.....xiv 1197
New battleships and torpedo boats, 1896.....viii 596
New battleships, Br., 1894, vi 423; 1902, compared to *Dominion* and *Commonwealth*, xiv 1251; *Nelson* class.....xvi 998
New battleships, Ger., des.....xvi 1331
New Bedford, Mass., tests of pumping engines and boilers.....i 299, ii 26
New British Admiralty scheme of training naval officers.....xv 144
New classification, Society.....v 661
New coal calorimeter.....x 204
New cruisers, Br., 1895.....vii 418
New cruisers (two), Italy, 1896.....viii 410
New cruisers, Portugal, 1896.....viii 851
New cruiser, Rus., 1895, des.....vii 607
New Cunarders.....iv 324
New defenders of the *America's* cup.....v 650
New drydock being built at Newport News.....x 1106
Newell, W. S.—Contract trial of the U. S. monitor *Nevada*.....xv 105
New engineering buildings, University of Michigan.—Cooley.....xv 908
New England, mer. str., data.....x 928
New explanation of accident to *City of Paris*.....iii 122
New examination for engineer officers of the U. S. Navy, U. S. Navy Regulation Circular, No. 109–110.....iv 462, 468
New form of boiler water gauge.....x 777

New form of steam-and-hand-operated stop and throttle valve.—Willits, xvi 1240
New forms of evaporators.—Baird, ii 495; discussion: McFarland.....ii 503
New Goubet submarine boat, 1896.....viii 158
New Government testing tanks for ships' models at Washington Navy Yard.....xi 712
New Hampshire, des.....xvi 334, 1255
New Hampshire, mer. str., des. and trials.....iv 323
New high-duty record for pumping engines.....x 1090
New Jersey, data, xii 529; launch.....xvi 1309
New lake steamers, 1897.....ix 840
New London, Conn., coaling station.....xii 191
New Orleans, des., x 529; data, x 534; stability of, xi 1045; steaming radius, xiii 62; coal consumption.....xv 366, 379
New police boat for New York City.—Parsons.....vi 345
Newport, gunboat *No. 12*, des., i 351; named, viii 799; launch, ix 140; des., vii 581; bids, vii 804; des. and contract trials, progressive, ix 549; steaming radius.....xiii 62
Newport measured-mile trials, *Atlanta*, *Boston*, *Chicago*, *Yorktown*.....i 352
New revenue cutters.—McAllister.....vii 561
New royal yacht, Br.....x 231
New scouts, Br.....xvi 985
New second-class cruisers, Br., 1893.....v 516
New ships, U. S., 1882–89, i 236; 1890, ii 409; 1892, iv 493; 1900.....xii 528
New ships of the International Navigation Company.....v 522
New shipbuilding program for British Navy, 1893.....v 486
New Spanish cruiser *Infanta Maria Teresa*.....v 960
New steamer for the Fall River Line, des.....iv 848
New Thornycroft boiler, the.....vi 156
Newton, Mass., pumping engine, Blake high-duty, v 465; digest of experiments.....v 769
New torpedo boats, Br., des. and comparison with former types...iv 834, v 655
New type of ferrules in the British Navy.....v 715
New vessels, names of.....xvi 994
New vessels proposed by general board.....xvi 1313
New York, armored cruiser *No. 2*, increase in length and displacement, iii 126; weight of boilers, vi 661; des., ii 231; bids, ii 407; launch, iv 117; work on, iv 291; boiler weights, iv 703; auxiliary machinery list, v 68; total number steam engines and cylinders, v 68; preliminary trials, v 499; contract trial, v 613; air-pump data, vi 532; run of, vii 571; steaming radius, xiii 64; coal consumption.....xv 366, 379
New York, mer. str., des., i 166; record voyage, vi 791; speed, iv 99, v 1019, see *City of;* change of flag, v 235; shaft breakage, xii 848; condenser explosion.....xiii 539
New York, see *Harvard*.
New Zealand, Br., launch.....xvi 682
Nezinscot, data.....x 534
Niagara, data.....x 534

Niagara, yacht, des., x 296; data.....x 941
Niagara II, yacht, des.....ix 841
Nicholson, torpedo boat *No. 29*, named, x 818; launch, xiii 1085; full data.....xiii 1082
Nickel: -bronze for high-pressure steam fittings, xii 520; in gun steel, xi 147; silicon- and chromium-steels, special, xi 144; steel, iii 506; armor, trials at Creusôt, v 1028; age of, xi 1030; and mild-steel boiler tubes, xi 633; boiler tubes, for naval purposes, xv 420; boiler tubes, non-corrosive, xvi 328; doubtful value for machinery of torpedo-boat type, xv 801; for crank pins and axles.—Porter, x 474; properties of, xi 462; properties and possible uses, xii 108; railway rails, xii 520; rivets.....x 1038
Niclausse, A. and J.—Defense of the Niclausse boiler.....xiv 485
Niclausse, Belleville, D'Allest boilers, compared in *Friant*, *Bugeaud*, *Chasseloup-Laubat*, Fr.....vii 408
Niclausse boiler: vi 364; vii 402; advantageous features, x 118; advantages, xv 1167; baffling, xvi 156; boiler committee report, xiv 875; British cruisers, xiv 234; British report on, xvi 920; *Carnarvon*, Br., xiv 921; circulation shown by model, viii 495; *Colorado*, xvi 1133; compared with others, xiv 416; compared with other stationary types, x 117; defense of, xiv 485; des.—Howe, xv 1163; description and management, vii, 365; details of construction, xiii 377; *Devonshire*, Br., xiv 921; *Freya*, *Gazelle*, Ger., xiv 117; *Friant*, Fr., viii 375; *Garibaldi*, It., xiv 980; in navies, xv 1172, xvi 292; interim report of boiler committee, xiii 358; *Jean Bart*, Fr., xiv 325; *Maine*, xiv 1133, xv 951; *Minnesota* and *Dakota*, mer. strs., xv 1163; *Nevada*, xv 105; weight compared with other monitors, xv 576; safety water-tube, trials of, x 110; ships fitted with, data, xiv 500; *Suffren*, Fr., x 1202, xvi 699; test at Cramp's, xi 881; test under forced draft, xvi 1060; trial data, various vessels.....xv 1171
Nicomedia, mer. str., data.....xiii 540
Nictheroy, see *Buffalo*.
Nisshin (Moreno), Jap., purchase and des.....xvi 364
Niger, Br., details, v 226; machinery trial, v 743; new engines and boilers.....xiv 1249
Niitaka, Jap., des.....xiv 354, 357
Niji, Jap., trials and des.....xii 256
Nile, Br., coal consumption.....xiii 1028, 1031, 1032
Nile, mer. str., des. and trials.....v 1069
Nile, Upper, light-draught paddle steamers for.....iv 836
Niles, Marston.—A study of the energy of the bow wave.....xi 591
Nineteenth century in a nutshell.....xiii 161
Niobe, Br., des., vii 418; note, vii 814; comparison with new cruisers, viii 557; machinery data, viii 568; launch and des., ix 409; trials, x 856, xi 243, 322; run in English Channel.....xii 738
Niobe, Ger., trials, xiii 297; coal consumption and boiler, Thornycroft, data.....xiv 117
Nippon Maru, mer. str., data.....x 1224

Nipsic, at Samoa, i 209; disabled propeller.....i 356
Njord, Swed., data.....ix 193
No. 295, see *Sylph*.
Nos. 109, 110, 111, 112, 113, Br., trials.....xvi 259
No. 128, Fr., comparative data.....ix 35
No. 149, Fr., comparative data.....ix 35
No. 183, Fr., comparative data.....ix 35
Nos. 278 to *294*, Fr., des.....xvi 700
No. 281, Fr., trials.....xvi 1015
No. 283, Fr., trials.....xvi 1330
No. 285, Fr., launch.....xvi 1015
Nodder, J.—Marine boilers, efficiency of combustion and higher steam pressure.....viii 775
Noll, Augustus.—Discussion, electric lighting of ships.....iii 523
Nomenclature of electrical apparatus.....xii 1043
Nominal efficiencies of machinery.....xi 763
Non-algebraic curves, use of ordinates in treatment of maxima and minima.....iv 71
Non-conducting coverings, service defects.....xiv 9
Noraumore, mer str., data.....xi 270, xii 1122
Norge, Nor., launch.....xii 574
Norman, mer. str., dimensions, vi 84; des.....vii 178
Normand boilers: v 946; *Bagley*, xiii 1082; *Barney*, xiii 1082; *Biddle*, xiii 1082; *Bagley*, *Barney*, *Biddle*, xiii 653; *Blakely*, xiii 1082; characteristics of, xv 1065; compared with others, xiv 421; *T. A. M. Craven*, xiii 1082; *Dahlgren*, xiii 1082; *De Long*, xiii 1082, xiv 833; destroyers, Br., *Surly*, *Shark*, *Banshee*, *Ferret*, *Rocket*, *Contest*, *Dragon*, *Lynx*, vii 797; *Dupont*, xiii 1082; efficiency, xvi 159; *Gwin*, torpedo boat, x 500, xiii 1082; *Lawrence* and *Macdonough*, xv 677; *Morris*, xiii 1082; *Porter*, xiii 1082; ships fitted with, data, xiv 502; *Talbot*, torpedo boat.....x 500, xiii 1082
Normand's tubulous boiler on torpedo boat *No. 140*, Fr.....iv 491
Normand, A.—Characteristics of the Normand water-tube boiler.....xv 1065
Normand, J. A.—Engine vibrations, v 980; laws of similitude regarding questions of naval construction, vii 284; discussion, water-tube boilers, viii 507; strength of high-speed vessels, xiv 1186; the speed problem, ix 29
Normand-Sigaudy boilers: xv 1074; *Depuy de Lôme*, Fr., xvi 350; in navies, xvi 292; *La Hire* Fr., *Chateaurenault*, Fr., *Jeanne d'Arc*, Fr., xii 569; *Montcalm*, Fr., xiv 968; ships fitted with, data.....xiv 502
Normand torpedo boats, comparative data.....ix 351
Normannia, mer. str., des., ii 237; dimensions and data, iv 102, vi 162; record.....vi 218
Norse King, see *Rainbow*.
Northampton, Br., des.....i 172, 265
North Carolina, des.....xvi 1255
Notheastern, mer. str., data.....xiii 539
North German Lloyd steamers, new, vii 857; data, viii 646, 860; contracts for, viii 207, 861; 1900.....xii 580

Northland, mer. str., launch.....vii 178
North Lyell, rod pressure, xiv 21; cylinder data.....xiv 37
Northtown, mer. str., data.....xiii 539
Northumberland, Br., des.....i 264
Northward, mer. str., data.....xiii 539
Northwest, mer. str., des., vi 212; machinery test.....vi 430
Northwestern, mer. str., data.....xiii 539
Norton, Charles L.—Protection of steam-heated surfaces.....x 708
Norton, Harold P., Lt. Comd., U. S. N.—Contractor's full-power, forced-draft trial of the U. S. S. *Yorktown*, i 137; contractor's full-power, forced-draft trial of the U. S. S. *Baltimore*, i 337; discussion, tubulous boilers, ii 210; speed trials for fast ships, ii 68; engine-room signals, iii 197; repairing a broken valve chest on the *Concord*, vi 761; discussion, logical arrangement of the motive power of warships, xi 679; contract trial of the U. S. protected cruiser *Albany*.....xii 281
Norwalk Iron Works, air compressors for *Terror*.....ix 17
Norwegian Navy, water-tube boilers, xii 748; Yarrow boilers in.....xv 838
Notes from abroad.—Worthington.....xvi 886
Notes of the Society, business statements, prize assays, nominations, etc., ii 249, iii 148, iv 141, x 1235, xi 555, 815, 1123, xii 276, 584, 853, 1135, xiii 330, 1143, xiv 376, 717, 1286, xv 279, 606, 922, 1258, xvi 380, 1343
Notes on analysis of engine trials.—Allderdice.....ii 510
Notes on analysis of engine trials, investigation.—Isherwood.....iii 33
Notes on coals of the Pacific coasts.—Roelker.....i 69
Notes on details of construction and arrangement of marine machinery.—Theiss.....xiv 1
Notes on Du Temple boilers.....viii 786
Notes on inspection and manufacture of steel plates.—Hunt.....i 128
Notes on modern boiler-shop practice.—Engard.....ii 129
Notes on performance of S. S. *City of Alpena*.—McAlaster.....v 973
Notes on routine work of engineers' division, naval vessels.—Dinger..xvi 1164
Notes on screw-propeller action.—Kinkaid.....i 124
Notes on steam superheating.—Patchell.....viii 346
Notes on the development of cylindrical heads for steam boilers.—Leopold.....iii 221
Note on the direction of rotation of propellers on twin-screw war vessels.—Laubeuf.....xv 1175
Notes on the effect of temperature on certain properties of various metals and alloys.—Bryan.....ii 144
Notes on the serious deterioration of steel vessels from the effects of corrosion.....xiv 599
Notes on the service of boilers of the S. S. *Sindh* of the Messageries Maritimes.....iii 253
Novel arrangement of feed-water heater in water-tube boilers.—Yarrow, x 409; discussion: Wingfield, 414; Durston, 417; Milton, 417; Rounthwaite, 419; Gray, 419; Hughes, 420; Haddon, 420; Watt.....420
Novel method of installing propeller shafting.—Webster.....xii 326
Novel type of towing steamers for service on the Yukon.....x 740

Novik, Rus., des., xiii 1052; data, xi 533, xiv 357, 366; compared with British scouts ..... xvi 674
Nozzles, steam, for turbines ..... xiii 115
Nueva España, Sp., des ..... iii 606
Nulton, L. M.. Asst. Engr., U. S. N.—Discussion, experimental station and engineer school, vii 468; temperature-entropy diagrams for steam and water ..... viii 285
Nymphe, Br., trials, i 86; des ..... i 264
Nymphe, Ger., launch, xii 256; speed, xiii 298; coal-consumption and boiler, Schulz, data ..... xiv 117
Nyrok, Rus., trials ..... xiv 684

O

Obituary.
Allen, Jeremiah M ..... xvi 373
Baker, Charles H., Chief Engr., U. S. N., viii 435; Baker, John Howard, P. A. Engr., U. S. N., ii 589; Barnard, Geo. A., xii 274; Barry, James Joseph, P. A. Engr., U. S. N., xiv 711; Beecher, A. M., Lt., U. S. N., xv 1256; Benham, Henry K., Lt., U. S. N., xvi 717; Bevington, Martin, Lt. Comdr., U. S. N., xv 1255; Borthwick, J. L. D., Chief Engr., U. S. N., retired, xvi 1342; Boyd, J. T., xvi 1342; Brown, Morris H., Lt., U. S. N., xvi 1342; Butterworth, James, Chief Engr., U. S. N ..... iii 613
Cline, Hugh Hadaway, Chief Engr., U. S. N., retired, x 1231; Conant, Frank Henry, P. A. Engr., U. S. N., x 1233; Copeland, Charles W ..... vii 201
Dade, F. C., Chief Engr., U. S. N., retired, xiv 715; De Valin, Charles E., Chief Engr., U. S. N., iv 872; Emery, Charles Edward, Ph. D., x 943
Fitts, Prof. James Henry, v 1100; Fisher, Clark, xvi 374; Flack, Emil, v 1100; Freeman, Edward R., Lt. Comdr., U. S. N ..... xvi 717
Greene, Albert S. Chief Engr., U. S. N., viii 435; Greene, S. Dane, xii 273
Haines, Hiram, iii 614; Harrison, William Henry, Commodore, U. S. N., xiii 326; Heaton, William W., Chief Engr., U. S. N., retired, vii 636; Henderson, Alexander, Chief Engr., U. S. N., retired, xiii 327; Hine, Robert B., Chief Engr., U. S. N., retired, vii 635; Howell, Charles P., Comdr., U. S. N ..... xii 274
Johnson, George R., Chief Engr., U. S. N., retired, x 1230; Jones, David Phillip, Chief Engr., U. S. N., retired ..... xv 276
King, Charles A. E., Lt., U. S. N., xiii 325; Kirk, Alexander C., LL. D ..... iv 870
Lay, John Louis, xi 549; Leitch, Robert Rose, Chief Engr., U. S. N ..... xi 548
Merritt, James H., xiv 714; Merritt, Darwin R., Asst. Engr., U. S. N., x 306; Mickley, Joseph Philip, Comdr., U. S. N., xiv 712; Morley, A. W., Chief Engr., U. S. N ..... xv 604
Pankhurst, John F., x 946; Pemberton, John, xvi 371; Porter, John Singleton, Asst. Engr., U. S. N ..... x 306
Rearick, Peter A., Rear Admiral, U. S. N ..... xiii 326

Smith, David, Rear Admiral, U. S. N., retired, xv 919; Smith, William Scharf, Chief Engr., U. S. N.....ix 217
Talcott, Charles Gratiot, Asst. Engr., U. S. N.....i 270
Voorhees, Philip Randall.....viii 218
Warburton, Edgar T., Lt. Comdr., U. S. N., xvi 717; Wells, Edwin, Chief Engr., U. S. N., i 96; Wharton, B. B. H. Chief Engr., U.S. N., retired, xiii 328; Whitaker, Ezra, J., Chief Engr., U. S. N., retired, vii 635; White, George H., Chief Engr., U. S. N., iii 613; Woods, Prof. Arthur T., v 255; Wright, Sir James.....xi 552
Zeller, Theodore, Commodore, U. S. N.....xiii 811
Object lessons.—Willits, the lens and pencil in mechanical engineering, xi 692; piping, shafts, etc., xi 897; bearing metals, heavy forgings, copper piping and steam-engine progress.....xii 130
Obliquity of connecting rods in valve diagrams, graphic method of considering ..... v 991
O'Brien, torpedo boat *No. 30*, named, x 818; full data.....xiii 1082
O'Brien, Chili, purchase .....xiv 618
Ocean, Br., note, viii 378, 807; data, ix 408, x 862; trials....xi 795, xii 243, 246
Ocean steamers, comparison of typical.....vi 162
Ocean steamships, fast.....v 808
Ocean records, 1898 .....xi 266
Ocean waves, height of .....xiii 201
Oceanic, mer. str., data, ix 442, xiv 1272; des., xi 262; machinery.....xi 1118
Ochakov, Rus., des .....xiii 1126
Odin, Br., data, xiv 320; trials.....xiv 961
Odin, Ger., des., ix 179; coal-consumption and boiler data.....xiv 116
Odin, Swed., launch.....viii 420
Office buildings, equipment of, in New York City.....xi 420
Officers, engineer, examinations for promotion, Navy regulation circulars Nos. 52, 53, i 93–95; Nos. 109 and 110 rescinding Nos. 52 and 53, iv 462–468
Officers, naval, education and training of.....xv 902
Official Army Journal in England.....xvi 638
Official report on the operation of Ericsson's surface condenser and evaporator for marine engines, 1847.....xi 82
Official trials of submarine boats *Adder* and *Moccasin*.—White.....xv 39
Official trial of U.S.S. *Florida*.—Moritz.....xv 546
Official trials of the submarine boats *Grampus* and *Pike*.—Morgan.....xv 584
Official trial of the revenue cutter *Hudson*.—McAllister.....v 703
Official trials of the submarine boats *Plunger*, *Porpoise* and *Shark*.—Mahony.....xv 859
Offley, C. N., P. A. Engr., U. S. N.—The contract trial of the U. S. torpedo boat *Foote*, ix 655; work of the *Oregon* during the Spanish-American war.....xv 1144
Oglebay, E. W., mer. str., data.....viii 651
O'Higgins, Chili, data, ix 143; des.....x 838
Ohio, Act of Congress, x 798; des., x 1163; des. and contract trials, xvi 1027; Thornycroft boilers, xi 232; launch.....xiii 472

Ohio, mer. str., repair ship, vii 72; engines, vii 619; Belleville boiler....ix 198
Ohio coal, Jackson, analyses.....xi 94
Oil: and coal, *Alameda*, mer. str., comparative performance, xvi 806; and coal, compared as fuel, vii 749; and gas engines, early types, x 165; as fuel for boiler testing, x 136; barge *No. 55*, see water barge *No. 1;* Borneo, for fuel, xi 446; burners, liquid-fuel report, xvi 719; classification of, xvi 839; -burning test, Hohenstein, summary, xvi 764; crude, analyses, xvi 757; filters, v 577; for fuel supply, repair ships, xiv 1067; holes for bearings, position of, ix 113; motors, weight and power of, vi 582; position of, for marine engine bearings, ix 118; linseed, raw, for preserving steel, xv 634; olive, method of detecting adulterations in, i 162; quality of, for marine engine bearings, ix 123; residuum of petroleum, advantages as fuel, vii 746; disadvantages, vii 762; restrictions on trials, Br., xvi 1286; specifications for U. S. Navy, xi 469; tests in Diesel motor, xi 79; volatile, in boilers, physical and chemical properties...xi 462
Oil City Boiler Works, boiler test, Hohenstein.....xvi 748
Oil fuel.—Adoption in British Navy, xvi 331; apparatus, successful operation, xiii 216; burning, on the Pacific coast, xiv 262; combustion, xvi 826; comparison, locomotive and torpedo-boat work, xvi 823; dangers from, xiii 469; difficulties of use on naval vessels, xvi 863; economical advantages, xvi 879; experiments, xi 720; on *Ancona*, It., iii 282; on *Castlefiardo*, It., iii 282; hydraulic life boat *Queen*.—Platt, x 385; explosion on *Geo. W. Loomis*, mer. str., xvi 1273; extract from report of Engineer-in-Chief, 1902, xiv 1226; fire on *Kaiser Friedrich III*, Ger., from damage to pipes in grounding, xiii 637; for torpedo boats, x 208; German navy, xvi 1018; installation on *Mariposa*, mer. str., xvi 788; military and strategic value, xvi 942; *Nebraskan*, mer. str., xvi 708, 810; *Nevadan* mer. str., xvi 810; on battleships, xvi 693; production, xvi 875; trials of *Spiteful*, Br., xvi 1328; see Liquid Fuel.
Oil in boilers.....iii 184
Oiling arrangements: marine machinery, xiv 4; marine engine bearings, ix 118; steam turbines, Westinghouse-Parsons.....xiii 128
Okean, Rus., data, xiii 514; launch.....xiv 683
Olive oil, method of detecting adulterations in.....i 162
Olympia, bids, ii 408; des., ii 230; data iv 293, vi 652; launch and des., iv 815; alignment of shafting and boring out stern tubes, v 7; preliminary trial, v 1033; trials, vi 175; contract trial, vi 241; air-pump data, vi 532; full-power run, viii 581; battery compared to *Eclipse*, Br., x 786; data compared with protected cruisers, xii 1015; steaming radius, xiii 64; coal consumption.....xv 366, 379
Omrah, mer. str., des.....x 1215
On crank shafts.—Macalpine.....viii 665, ix 42, 318, 482
One- and two-wire systems of electric distribution.....xii 489
Oneida, auxiliary navy, x 537; data.....x 824
Oneonta, yacht, launch and des., vii 630; des. and data.....x 398
Onondaga, speed.....x 828
On the comparative merits of cylindrical and water-tube boilers for ocean steamships.—Howden, vi 373; discussion: Seaton, 387; Yarrow, 388;

Thornycroft, 392; White, 393; Howden, 394; Rosenthal, 397; Sampson, 407; Gilbert.....409
On the compression of back-pressure steam into the waste space of cylinders.—Isherwood.....xii 770
On the construction of boilers adapted to forced draft.—Yarrow,.....iii 229
On the effect of modern accessories on the size and cost of war ships.—Whiting.....xv 350
On the formation of cavities in water by screw propellers at high speeds.—Barnaby.....ix 678
On the inertia stresses of a slide valve.—Macalpine.....vi 272
On the limits of economical speed of ships.—Tennyson-D'Eyncourt, xiii 661
On the measurement of wake currents.—Calvert.....v 869
On the necessity and value of scientific research in naval engineering matters, as related to the U. S. Navy, and the necessity of an engineer training for the younger members of the engineer corps of the Navy.—Bieg, vii 449; discussion: Isherwood, 454; Manning, 457; Haswell, 458; Durand, 459; Loring, 462; Cathcart, 463; Rae, 463; Bartlett, 465; Stickney, 466; Kinkaid, 467; Nulton, 468; Warburton, 469; Willits, 471; Freeman, 473; Voorhees, 475; Ross, 475; Milligan, 475; Ranson, 477; McFarland, 479; Edwards, 481; Hollis.....481
On the present position of water-tube boilers as applied for marine purposes.—Milton, v 931; discussion: Yarrow, 952; Barnaby, 954; Pratten, 957; MacGregor, 957; White.....957
Onyx, Br., launch, iv 833; details, v 226; des. and trial.....vi 200
Open-hearth steel: basic, experiments with effect of riveting, iv 448; furnaces, xv 127; improvement in, xi 449; castings, the manufacture of.....i 185
Ophelia, mer. str., trials.....vi 590
Ophir, Hol., data.....xiii 502
Ophir, mer. str., des. and trials, iv 135; data.....vi 162
Opossum, Br., trials, viii 396; repairs.....viii 843
Oquendo, Sp., see *Almirante Oquendo*.
Orage, Fr., des.....iv 127
Ordinates, use of in treatment of non-algebraic maxima and minima curves.....iv 71
Ordnance trials, British.....vi 168
Ore: dock, 40,000 tons capacity, xiii 182; unloading, record in.....xvi 1302
Oregon, authorization and des., ii 409; changes in and bids, ii 575; work on, iv 292; engine data, iv 820; launch, v 1034; preliminary trial, vi 602; des. and contract trial, viii 439; correction of data, viii 799; voyage from Puget Sound, Wash., to Jupiter Inlet, Fla., and service in Spanish war, x 621; coal economy on blockade duty, x 1044; time and coal consumption, voyage 1898, xii 432; steaming radius, xiii 64; fitting lignum vitae on bearings, xiv 260; coal consumption, xv 366, 379; work on during Spanish war.....xv 1144
Oregon, mer. str., dimensions and data, iv 102; data.....vi 162
Orel, Rus., trials, ii 237; launch, xiv 995; data.....xiv 1265
Organization of personnel, reserve torpedo-boat flotilla.....xv 760

Organization of the engineers' division on board a man-of-war.—Dyson, xiii 925; discussion: Parks, 938; Gow, 940; Moritz, 941; Kearney, 944; Little, xiv 228; Kinkaid.....xiv 231
Orient, mer. str., data.....vi 162
Orienta, yacht, des.....xiii 558
Orifice shapes, steam flow through.....xvi 564
Oriolle boilers, v 940; ships fitted with.....xiv 504
Orlando, Br., des. and weights.....i 91
Orleg, Rus., data.....xiv 1265
Ormuz, mer. str., trial compared with *Ophir*, iv 140; data.....vi 162
Oroya, mer. str., data.....vi 162
Orsat combustion tester on *Sicilia*, It.....viii 583
Orlégal, mer. str., Belleville boilers.....viii 151
Orlona, mer. str., launch.....xi 808
Orvis system for increased vaporization and smoke prevention.....iii 295
Osado, Sp., dimensions, ix 192; launch.....ix 438
Osceola, data.....x 534
Osceola, yacht, des.....x 939
Oscillations, of battleships.....vi 471
Osiotr, Rus., data.....xiii 304
Osliabya, Rus., dimensions, viii 200; data, ix 433; des.....xvi 369
Osprey, Br., speed.....ix 808
Ostrich, Br., launch, xii 565; trials.....xii 838, xiii 271
Otawa, Jap., launch.....xvi 366
Otter, Br., launch.....ix 174
Otto Cycle, the composition of.....x 165
Ottoman Navy.....v 232
Otvajny, Rus., des.....iii 605
Our new cruisers and their coal supply, Br.....iv 796
Outboard- and inboard-turning propellers.....xv 1175
Outboard- or inboard-turning propellers, effect of.....x 485
Outboard- vs. inboard-turning propellers *Durandal* and *Hallebarde* vs. *Pique* and *Epée*.....xv 1183
Outflow of steam, experiments on.....xvi 564
Outlook in the American iron industry.....xi 1019
Out-turning vs. in-turning screws.....xv 433
Outward-turning propellers, boiler committee favors.....xiv 874
Overheating in fire surface of boilers.....ii 201
Ovoro, Jap., des.....xii 257
Oxygen, manufacture of, liquid air as a means.....xii 447

P

P35 and *P36*, Fr., data.....ix 178
P, class, Br., trials, i 85, xiii 282; removal of ventilating cowls.....xiv 321
Pacific cable data.....xii 184
Pacific coast coals, notes on.—Roelker.....i 69
Pacific mail steamers, 18,000 tons.....xii 577

Pacific mail steamship *Korea*.—Mallory.....xiv 380
Packings: metallic, principles of design, xv 404; piston-rod, essential qualities, xiv 3; for pneumatic system, *Terror*, ix 26; for tubes, Belleville boilers.....xiv 278
Pactolus, Br., data, viii 618, 834, x 1197, xi 243, 326; launch.....ix 168
Paddle steamer, machinery data.....viii 568
Paddle steamers: light draft, for upper Nile, iv 836; *Isle of Aran*, v 525; *Tartare* and *Etna*, des. and trials, iv 580; *Ville de Douvres*, trial, iv 409, 539; analysis of trial results.....iv 539
Paddle-wheel data: *Ville de Douvres*, iv 412, 545; *Tartare* and *Etna*, comparison of radial and feathering.....iv 580
Paducah, launch.....xvi 1313
Paints: and painting steel, xv 628; and varnishes for coating metal immersed in sea water, x 782; for under-water body of ships, xiv 587; protective power of.....xii 484
Painting: bronze propellers.—Holzapfel, xvi 644; on metal.—Sabin, book received, x 1229; wood and iron frame work.....v 713
Pallada, Rus., note, viii 638; data, ix 188; des., ix 823; note, x 825; launch and dimensions, xi 1114; trials.....xiv 684
Pallas, Br., trial.....iii 268
Pandora, Br., des., i 358; data, xii 247; trials, xiii 274, 282, xiv 206; speed, xiii, 490; screw propellers.....xiii 776
Pangrango, Hol., speed, xiii 502; oil fuel.....xiii 786
Panther, auxiliary navy, x 537; data.....x 824
Panther, Br., launch, ix 174; speed.....ix 808
Panther, Ger., launch.....xiii 784
Paoli, data.....x 534
Paris, Rus., des.....vi 429
Paris, see *Yale* and *City of Paris*.
Paris, mer. str., see *City of Paris;* accident and explanation, ii 238, 429, iii 122, vi 290; des., i 66; new machinery, iii 167; runs, i 167, 270, iv 99, 494, 792, v 755; change of flag, v 235; speed, v 755; difficulties in floating.....xii 231
Parker, Wm.—Bursting of copper steam pipes of steamers *Elbe* and *Lahn*, iii 410; discussion, bursting of *Concord's* main steam pipe.....iii 419
Parkhurst, John F.—Obituary.....x 946
Parks, W. M., Comdr., U. S. N., the U. S. torpedo boat *Rodgers*, ix 684; discussion, organization of the engineer's division on board a man-of-war, xiii 938; liquid-fuel report, xvi 719; test of a Niclausse boiler under forced draft.....xvi 1060
Parr, A. C., Admiral, R. N.—Comments on rotation of propellers.....xvi 121
Parsons, Hon. Charles A.—The application of the compound steam turbine to the purpose of marine propulsion, ix 374; reply to discussion, ix 383; rotary vs. reciprocating marine engines, ix 569; the marine steam turbine, xiii 432; reply to discussion, xiii 439; the steam turbine, xiv 1216
Parsons, H. de B.—New police boat for New York City.....vi 345
Parsons manganese-bronze.....iii 491

Parsons marine steam turbine.....v 899, xii 526, xiii 432, xiv 253, xvi 207; *Lorena*, *Turbinia*, *Tarantula* .....xvi 1095, 1117
Parsons turbo-motor.....xi 919
Partenope, It., des.....ii 423
Parthenia, yacht, launch and des., viii 661; des. and data.....x 395
Partial collapse of a corrugated furnace flue.—Hayes .....vii 131
Particulars of U. S. naval vessels.....iii 422
Partridge, Br., trials .....i 85
Pascal, Fr., dimensions, viii 189; coal consumption, viii 849; trials.....ix 177
Passed assistant engineers, examinations for promotion, Navy regulation, circular No. 53, i 95; circular No. 109 rescinds No. 53.....iv 462
Patchell, William H.—Notes on steam superheating .....viii 346
Patent log, is it maligned?.....ii 227
Patent logs, inaccuracies of, ii 69; defects of, ii 98, criticism of.....vii 39
Patents, what they are not.....xii 1057
Pathfinder, Br., launch.....xvi 1007
Pathfinder and *Patrol*, Br., scouts.....xvi 985
Patria, Arg. Rep., launch, vi 176; des. and trials.....vi 799
Patrie, Fr., des .....xvi 353
Patrizia, Ger., cylinder data.....xiv 37
Patrol, Br., launch.....xvi 1325
Patrol, police boat, New York City.....vi 345
Patterns and castings as witnesses .....xi 474
Patterson, auxiliary navy, x 537; data.....x 824
Paul Jones, destroyer *No. 10*, named, x 818; full data, xiii 1082; contract and standardization trials.....xiv 773
Pau-tah, mer. str., trials.....vi 590
Pawnee auxiliary navy, x 538; data.....x 824
Pay of engineer officers, British.....xv 171
Peabody, Professor Cecil H.—Digest of his experiments with Blake pumping engine, Newton, Mass .....v 769
Peacock, Br., trials .....i 85
Pearl, Br., trial.....iii 268
Peck-Wheeler system of high-temperature feed-water heating.....v 196
Pecoraro, Nino, Engr., First Class, R. I. N.—Direction of rotation of propellers, xv 1080; on rotation of propellers .....xvi 120
Pectan, mer. str., des. and speed .....vii 853
Peculiarities of steel.....xiii 1071
Pedro, see *Hector*.
Pegasus, Br., dimensions, viii 391; launch and des., ix 417; trials, x 1195, xi 243, 326
Pelayo, Sp., des. and trials, iii 283; boilers.....x 582
Pelenk-i-deria (*Sea Tiger*), Turk., speed.....viii 856
Peleus, mer. str., des .....xiii 806
Pelican, Aus., torpedo-depot ship, des. and trial .....iv 319
Pelican, Ger., coal-consumption and boiler data .....xiv 116
Pelorus, Br., des., i 358, vii 419; machinery contract, vii 600; launch and des., viii 390, ix 166; machinery data, viii 568, xi 330; hull and machinery, ix 416; run, x 228; trials, xi 326; machinery space.....xiii 867

Pelorus class, Br., comparison with Barrow cruisers, viii 557; characteristics.....viii 563
Pemberton, John.—Obituary.....xvi 371
Pembroke Castle, mer. str., data.....vi 162
Penalty weights, *Cleveland*, comments on.....xv 1139
Penelope, see *Yankton*.
Penelope, yacht, des.....x 399
Pennsylvania, data, xii 529; des., xii 1123; trials.....xvi 1311
Pennsylvania, mer. str., dimensions, vii 851; launch, viii 862; des., ix 439; machinery test, mechanical stokers.....xi 557
Pennsylvania R. R. ferryboat, des.....x 609
Pensacola, data.....vi 652
Penwood, see *Powhatan*.
Peoria, auxiliary navy, x 538; data, x 824; steaming radius.....xiii 64
Peregrine, yacht, des.....vii 630
Père Marquette, mer. str., des.....xiii 313
Peresviet, Rus., dimensions, viii 200; data, ix 433; launch, x 894; engine trials, xii 260; trials, xiii 305; des.....xiii 1127
Performance, continuous, of a marine engine, method of determining.....ix 1
Performance data.
Alabama, xii 881; progressive trials, xiv 192; *Albany*, xii 310; *Albatross*, Fish Com. str., vi 508; *Argonaut*, Br., xi 368; *Amphitrite*, Br., xi 379; *Annapolis*, ix 567; *Arkansas*, xiv 1184; Atlantic liners.....iv 102
Bagley, xiii 656; *Bainbridge*, xiv 1021; *Baltimore*, i 344, iii 582; *Bancroft*, v 382; *Barney*, xiii 657; *Barry*, xiv 1029; *Bennington*, iii 212; *Biddle*, xiii 658; *Blakely*, xvi 1089; *Blenheim*, Br., v 504; *Boston*, iii 582; *Brooklyn*.....viii 762
Campania, mer. str., v 405; *Castine*, v 866; *Cecille*, Fr., v 504; *Charleston*, old, i 324, iii 582; *Chauncey*, xiv 1027; *Chicago*, iii 582; *Chicora*, mer. str., iv 866; *Cleveland*, xv 1133; *Concord*, iii 96, 582; *Condor*, It., xii 79; *Colorado*, xvi 1136; *Columbia*, vi 42; *Cushing*.....iv 45, 50
Decatur, xiv 71; *De Long*, xiv 841; *Denver*, first trial, xvi 86; second trial, xvi 617; *Des Moines*, xvi 233, 236a; distilling plant, Dry Tortugas, xii 95; *Dolphin*.....iii 582
Edgar, Br.....v 504
Florida, xv 571; *Foote*, ix 666; *Forbin*, Fr.....v 504
Grampus, xv 590; *Gresham*, ix 265; *Gwin*.....x 497
Helena, ix 371; *Hudson*, U. S. R. C.....v 709
Indiana, vii 664; *Illinois*, xiii 584; *Iona*, mer. str., iii 390; *Iowa*.....ix 479
Julio, 9 de, Arg. Rep.....v 504
Katahdin, viii 16; *Kearsarge*, xi 849; progressive trials, xiv 192; *Kentucky*, xii 23; *Korea*, mer. str.....xiv 394
Latona, Br., v 504; *Lawrence*.....xv 686
Macdonough, xv 691, 693; *Machias*, v 866; *Maine* (old), vii 30; *Maine*, xiv 1139; progressive trials, xvi 528; *Manning*, U. S. R. C., ix 722; *Marblehead*, vi 144; *Marietta*, ix 653; *Massachusetts*, viii 267; progressive trials, xiv 192; *Mayo, 25 de*, Arg. Rep., v 504; *McCulloch*, U. S. R. C., ix 722; *Medusa*, Br., v 504; *Minneapolis*,

Performance data.
vi 728; *Missouri*, xv 1208; *Mongolia*, mer. str., xvi 249; monitors *Arkansas*, *Florida*, *Nevada* and *Wyoming* compared, xv 823; *Monterey*, v 136; *Morris* ..... x 506
Nashville, ix 589; *Nevada*, xv 106; *Newark*, iii 115, 582; *Newport*, ix 558; *New York* ..... v 631
Ohio, xvi 1057; *Olympia*, vi 256; *Oregon*, viii 474; Puget Sound, Wash., to Jupiter Inlet, Fla ..... x 626
Paul Jones, xiv 810; *Pennsylvania*, mer. str., xi 572; *Perry*, xiv 797, 801; *Petrel*, iii 582; *Philadelphia*, ii 533, iii 582, v 1032; *Piemonte*, It., v 504; *Pike*, xv 590; *Preble* ..... xiv 806
Raleigh, viii 301; *Reina Regenta*, Sp ..... v 504
San Francisco, ii 551, iii 582; *Stewart*, xv 119; *Surcouf*, Fr ..... v 504
Tacoma, xvi 26; *Talbot*, x 497; *Terror*, pneumatic system, ix 26; *Texas*, viii 92; *Tingey*, xvi 64; *Truxtun*, xiv 1098, xv 399; *Turbinia* ..... ix 381
Union ..... xi 160
Variag, Rus., xii 1012; *Vesuvius*, iii 582; *Vicksburg*, ix 558; *Victory*, mer. str, vii 777; *Ville de Douvres*, mer. str ..... iv 426,574
Wacouta, yacht, xiv 1164; *Wheeling*, ix 653; *Whipple*, xiv 1104, xv 399; *Wild Duck*, yacht, vii 87; *Winifred*, mer. str., x 994; *Wilkes*, xiv 863; *Wilmington*, ix 371; *Wisconsin*, xii 996; *Worden*, xiv 1106, xv 399; *Wyoming* ..... xv 97
Yorktown, i 144, iii 582; *Yosemite*, yacht ..... vii 691
Zenith, *City*, mer. str ..... vii 774
Performance of boilers of U. S. S. *Maine* ..... xv 951
Performance of French submarine torpedo boats ..... xiii 730
Performances of some quadruple-expansion engines, data of and ..... i 77
Performance of S. S. *City of Alpena*, notes on ..... v 973
Performances under steam, recent battleships, *Royal Sovereign* class, Br ..... vi 489
Permanence of iron and steel structures ..... xiii 210
Perry, destroyer *No. 11*, data, x 534, xiv 616; named, x 818; launch, xii 1096; trials, xiii 473; full data, xiii 1082; contract and standardization trial ..... xiv 773
Perseus, Br., dimensions, viii 391; launch, ix 804; trials, xi 243, 326, xii 246; speed ..... xi 1103
Persian, Br., des ..... i 358
Persic, mer. str., data ..... xii 269
Personnel: iv 747; bill, xi 435; annual report, Engineer-in-Chief, 1889, xi 859; for repair ships, xiv 1076; organization of, reserve torpedo-boat flotilla ..... xv 760
Perthshire, mer. str., boilers, Ellis & Eaves draft ..... vi 748
Pertuisane, Fr., data ..... xi 800
Peru, mer. str., des. and trial ..... v 233
Peter Jebson, see *Brutus*.
Petersburg, mer. str., des ..... vi 633
Petrel, air-pump data, vi 532; authorization and data, i 236; boiler data, iii 422; coal endurance, iv 670; crankshaft forgings, iii 3; date of trial,

i 83; engine data, iii 422; inertia stresses of valve gears, xii 920; preliminary trials, i 252; propeller data, iv 158, 402; run from China to San Francisco, viii 581; steaming radius, xiii 64; test of evaporators, i 291; trials.....i 355
Petrel, Br., coal consumption, xii 564; trials.....xiii 271
Petroleum: briquettes, v 1030, xiv 932; fuel in Italian navy, iii 282; fuel in metallurgy, xii 1065; industry in Japan, xii 1084; industry in Russia, xii 1076; motors, xi 1066; motors for small vessels, v 884; regulations, Suez canal, iv 107; tanks, effect of shell fire on.....v 486
Petropavlovsk, Rus., launch and des.....vii 174
Pheasant, Br., trials.....i 85
Phaeton, Br., data.....viii 392
Phenomena attending ship propulsion.—Mattice.....i 223
Philadelphia, authorization and data, i 236; machinery, i 249; launch, i 355, ii 583; preliminary trial, ii 231; trial, ii 412; des. and contract trial, ii 524; power of auxiliary machinery, iii 217; engine data, iii 422; boiler data, iii 422; coal endurance, iv 664; performance data, run from Callao to Honolulu, v 1032, vi 689; air-pump data, vi 532; steaming radius.....xiii 64
Philadelphia, see *Peoria*.
Philomel, Br., des., launch and cost.....ii 583
Phoebe, Br., trial.....iii 598
Phoenix, Br., des., i 358; dimensions, vi 615; launch and des., vii 428; trials.....viii 171
Phosphor: bronze, iii 496; bolts, standard U. S., safe load.....xiii 341
Phosphorus: the abuse of, xvi 981; effect in cupola practice.....x 1048
Photographs in mechanical engineering.....xi 692
Physical and chemical properties of volatile oils in boilers.....xi 462
Physical reasons for rapid corrosion of steel boiler tubes.....vii 413
Piaud, L.—Translation, the Belleville boiler.....xvi 383
Pickrell, James M., Lt., U. S. N.—Contract trial of the U. S. sea-going battleship *Illinois*, xiii 559; contract trial of the U. S. sea-going battleship *Iowa*.....ix 453
Piemonte, It., des. and trials, i 180; trials, i 263; performance data.....v 504
Piet Hein, Hol., launch, vi 808; trial.....viii 194
Pigeon, Br., trials.....i 85
Pig iron: better form for breaking up, x 1159; various melting points of, x 1014; world's production.....xiii 178
Pigmy, Br., trials, i 85; des.....i 267
Pike, name, xii 825; des., contract and standardization trial.....xv 584
Pilcher.—Discussion, watertight doors.....viii 343
Pilgrim, mer. str., Fall River Line, hull data.....iv 849
Pilgrim, yacht, des., v 652, 998; changes in.....vi 441
Pillar crane, large.....v 193
Pinta, launch for, forced-draft system.....i 330
Pinto, see *Presidente Pinto*.
Pioneer, Br., ordered, ix 804; trials.....xii 246
Pioneer, mer. str., engine data and trial.....v 245

Pipe: and boiler material, advance in manufacture, xi 1; connections, long, effect on indicator diagrams, ix 392; coverings, economy tests, x 708; -dip, P. & B., for iron water pipes, xi 942; flanges, extra heavy, standardization of, xiv 274; joint for high pressures, xi 744; threads, taper of ..... xi 231
Pipes: copper, wound, tests, vii 510; flow of steam through, experiments on, xi 193; for hot-air house heating, sizes for, xii 503; smoke, high, for *Brooklyn*, v 175; smoke, lofty, iii 453; steam, experiments to determine cause of explosions, vii 737; steam, remarks on, Milton.—vii 522; steam, their material, workmanship and arrangement, Brett.—v 347; steam, water rams in, iii 407; steam, welded steel, vi 731; water, cast-iron, coatings for ..... xi 931
Piping, copper: defective, xii 134; defects of brazed seams, *Concord's* main steam pipe, iii 399; steam and water, standard dimensions, iii 421; steam, bursting of on *Elbe* and *Lahn* ..... iii 410
Pique, Br., launch and des., iii 130; des. and trial ..... v 211, 216
Pique, Fr., data, xiii 499; lack of stability, xiv 330; and *Epeé* vs. *Durandal* and *Hallebarde*, inboard- vs. outboard-turning propellers.... xv 1183
Piscataqua, former *W. H. Brown*, data ..... x 824
Pistolet, Fr., note ..... xiv 329
Piston: effect of polishing on economy of working, vi 593; rod packings, metallic, principles of good design, xv 405; rod packing, essential qualities, xiv 3; speeds, increase during ten years, xiii 851; steel, failure of, *Charleston* ..... vii 789
Pitting of boilers ..... iii 182
Pitting and corrosion of boilers ..... iv 689, 691
Pittsburg coals: comparative tests, i 123; tests ..... xi 97
Planimeter, polar, Amsler's ..... v 665
Plant Liner, new, des ..... xi 805
Plant, ship, lighting ..... iv 802
Plassy, Br., launch and des ..... ii 421
Plates, steel: influence of copper on, xiii 678; manufacture, tests, and defects ..... xv 610
Platt, John.—Discussion: Trials of the Niclausse safety water-tube boiler, x 120; discussion, boiler testing with various fuels, x 148; oil-fuel experiments on hydraulic life boat *Queen*, x 385; discussion, water-tube boilers a necessity, xi 27; practical data relating to the building of bent-tube boilers ..... xii 25
Plotting curves for progressive trials ..... iv 587
Plover, Br., trials, i 85; des ..... i 266
Plunger, launch, ix 794; launch and des., x 366; contract trials ..... xv 859
Pluton, Sp., note, ix 438; launch, ix 825; trials ..... x 270
Plymouth, mer. str., Fall River Line, des., ii 587; hull data ..... iv 849
Pneumatic system of *Terror* for guns, turrets and rudder, ix 14; advantages of ..... ix 27
Pneumatic vs. hydraulic systems, *Terror* and *Amphitrite* compared, ix 542
Pneumatic tools in the Navy ..... xiv 930
Pobieda, Rus., data, xi 534; des. and trials, xiv 685; engine room ..... xiv 995

Pocahontas coal: *Cushing* tests, analysis, iv 39; analysis, vii 699; tests.....xi 96
Polar planimeter, Amsler's.....v 665
Police boat for New York City.....vi 345
Polonium.....xi 228
Poltava, Rus., trial.....x 1208
Polynesien, mer. str., des., iii 289; boiler weights and data, vi 395; Belleville boilers of, compared with cylindrical on *La Plata*.....viii 153
Polyphase power plant, Navy Yard, N. Y.....xiii 980
Pomona, mer. str., machinery trials.....vii 436
Pomone, Br., data, viii 834; trials.....vii 436, xi 326, xii 246
Pompey, auxiliary navy, x 538; data.....x 824
Ponce, mer. str., launch.....xi 806
Pontiac, auxiliary navy, x 538; data.....x 824
Pontoon: derrick, des., x 922; dock, Bermuda.....xiv 278
Popoffkas, Russian circular monitors, *Admiral Popoff* and *Novgorod*.....vi 2
Porcupine, Br., unsuccessful trial, viii 398; des. and trials.....viii 835
Porpoise, Br., speed, x 229; named, xii 825; data, xiii 476; launch, xiii 1085; contract trials.....xv 859
Port Antonio, mer. str., launch and des.....xiii 540
Port areas for steam engines.—Gutermuth-Wachsmann.....xvi 588
Port Chalmers, see *Glacier*.
Porter, torpedo boat *No 6*, trial, ix 401; repairs, x 221, full data, x 818, xiii 1082
Porter, H. F. J.—Hollow steel forgings, ix 84; steel forgings, ix 101; nickel-steel for crank pins and axles.....x 474
Porter, John Singleton, Asst. Engr., U. S. N.—Test of Bailey air pump, vi 768; Obituary.....x 306
Portland cement for steam joints, v 194; tests.....xii 228
Port Maria, mer. str., launch.....xiii 542
Portuguese cruisers, 1896, bids and des, viii 420, 851; 1,770 tons.....ix 183
Portuguese Navy, Yarrow boilers in, xv 838; Niclausse boilers in.....xv 1173
Possadnik, Rus., des., v 228; trials.....v 752
Possibilities of speed on the Atlantic.....v 710
Possibilities of the turbine.....xi 766
Post mortem revelations of the Keeley motor.....xi 207
Post, Walter A.—Electrically-operated 150-ton jib crane at Newport News shipyard.....xi 173
Potential and economic efficiency of Davis' foundry coke under conditions of actual service on board the U. S. S. *Dolphin*.—Baird.....vi 736
Pothuau, see *Amiral Pothuau;* des.....iv 841
Potomac, data.....x 534
Potts, Stacy, P. A. Engr., U. S. N.—Machinery of the torpedo boat *Cushing*.....ii 215
Poursuivante, Fr., des.....vii 173
Powell, W. B.—Steam plant of *Iroquois*.....vi 446
Power: and weight, relative, of electric, compressed-air and vaporized-oil motors, vi 582; calculation of, for marine propulsion, viii 310; distribution of, from combustion of coal in furnaces, iv 655; electric trans-

mission of.—Kennedy, vi 550; for navy yards, xiv 448, 814, 1109; in engineering works, x 1128; from blast-furnace gas, x 1148; increase of, for a given speed due to foul condition of ship's bottom.—McFarland, i 73; losses in the machine shop, xii 119; motive, of small vessels, v 882; of auxiliary machinery in per cent. of main engines, *Charleston*, *Philadelphia*, *San Francisco*, *Newark*, *Yorktown*, *Concord*, *Bennington*, iii 217; propulsive, of screw ships, vi 259; propulsive, x 88; plants: central, on board ship vs. distribution of power, x 95; polyphase-electric, Navy Yard, N. Y., xiii 980; St. Louis exposition.—Mallory, xvi 1139; required by machine tools, xi 756; required for electric welding, vi 780; required for propulsion.—Weaver, i 59; required to drive a marine-engine works, xiii 1058; transmission and distribution of on modern ships.....iv 173

Powerful, Br., note on, v 516; des., vi 197; launch and des., vii 599; comparison with new cruisers, viii 557; machinery data, viii 568, xi 330; speed, viii 613; trials, viii 813, ix 145, 802, xi 322; run to China, x 229; defects, x 559; data, x 1186; runs compared with *Terrible*, Br., xii 737; Belleville boilers, xiv 648, 917; repairs.....xiv 962

Powerful class, Br., data.....xi 242

Powhatan, auxiliary navy, x 538; data.....x 824

Practical and theoretical endurance of war ships.....iii 132

Practical application of formulae for finding the turning effort on the crank shaft of an engine.—Bryan.....vi 334

Practical data relating to the building of bent-tube boilers.—Platt.....xii 25

Practical hints in connection with "the problem," lecture before the Naval War College.—McFarland.....vii 57

Practical instructions for using the steam-engine indicator, book received.....v 1096

Practical marine engineering.—Durand, book received.....xiv 374

Practical test of oil fuel.—Tanglin.....xiv 609

Practice vessel *Bancroft*, authorization and data.....i 236

Practice vessel *Chesapeake*, des.....i 352

Prairie, data, x 534; steaming radius.....xiii 64

Prat, see *Capitan Prat*.

Pratten, W. J.—Discussion, present position of water-tube boilers for marine purposes.....v 957

Pray's steam tables and engine constants, book received.....vi 845

Preble, destroyer *No. 12*, named, x 818; full data, xiii 1082; contract and standardization trial.....xiv 773

Precieuse, Fr., des.....vii 173

Prellier, C. S. Du Riche.—Electrical efficiency.....vi 581

Premiums on trials.....vii 35

Preservation: of boilers when not in use, French regulations, iv 800; of marine boilers.—Leonard, iii 179; of marine boilers, discussion.—Baird, iii 438; of shafts.....i 364

Preserver, tail shaft.....v 712

Presidente Errazuriz, Chili, des. and trials.....iv 528

Presidente Pinto, Chili, des. and trials.....iii 607, iv 528

Presidente Sarmiento, Arg. Rep., des.....ix 795
Pressure in boilers, proposed rule for in steamboat inspection service, iv 219
Pressure in steam pipes, loss of.....xii 207
Pressures, higher, in marine boilers, etc.....viii 764
Pretoria, mer. str., Hamburg-American, data and trials, vi 590; launch, ix 834
Preussen, Ger., see *Kaiser Friedrich III*, dimensions, vii 827; triple screws, viii 551; details, viii 406, 556; launch.....xvi 362
Price, C. B., P. A. Engr., U. S. N.—Contract trial of the U. S. S. *Nashville*, ix 574; contract trial of the United States battleship *Kearsarge*, xi 823
Prices paid for auxiliary naval vessels.....x 1161
Prince Albert, Br., des.....i 266
Prince George, Br., data, vi 423; launch, vii 813; trials.....viii 809; xi 318
Prince George, mer. str., launch.....x 921
Prince of Wales, Br., launch and des., xiv 647; data, xiv 962; trials, xvi 258, 343
Princesa de Asturias, Sp., launch.....viii 855
Princess Alice, yacht, speed.....x 938
Princess Anne, mer. str., dimensions.....ix 443
Princess Clementine, mer. str., dimensions.....ix 206
Princess Maud, turbine steamer.....xvi 714
Princeton, gunboat *No. 13*, des., i 351, vii 581; bids and contract, vii 804; named, viii 799; steaming radius.....xiii 64
Principessa Elena, It., dimensions.....x 1202
Princess Wilhelmina der Nederlanden, Hol., des.....ii 426
Prinses Marie, mer. str., des.....vi 840
Printing telegraphy.....xi 503
Prinz Adalbert, Ger., launch, xiii 784; compared to *Prinz Heinrich*, xiv 334; des.....xvi 362
Prinz Bismarck, Ger., launch.....ix 814
Prinz Friedrich Karl, Ger., launch and dimensions, xiv 973; des., xvi 362; trials.....xvi 704
Prinz Heinrich, Ger., des., xii 1107; Dürr boilers, xiii 895, 901; compared to *Bismarck*, *Prinz Adalbert*, *Iwate*, *County* class, *St. Louis*, *Montcalm*, xiv 334; note, xiv 676; speed, xiv 974; trials.....xiv 1257
Prinz Heinrich, mer. str., des. and trial.....vi 839, vii 437
Prinz Regent Luitpold, mer. str., des.....vii 437
Prinzessin Victoria Luise, mer. str., des., xiii 323; data.....xiii 531
Priscilla, mer. str., des.....vi 436
Prize essay, British naval.....xii 1021
"Prize papers," resolution.....viii 437
Problem connected with the screw propeller.—Durand.....xv 887
Problem of building warships on the Great Lakes.—Sadler.....xv 458
Problem of combustion in water-tube boilers, and a means of its solution.—Weir.....x 723
Proceeding of the division of marine and naval engineering and naval architecture of the International Congress of Engineering, book received.....vi 224

Process for purification of sulphur from iron and steel.....iv 757
Proctor, A. M., Lt., U. S. N.—Water-tube boilers, notes on.....xvi 133
Producer gas, direct utilization of in Europe; objections to use of.....xi 111
Production: of aluminum, xiii 186; of iron and steel in the United States, xi 739; of manganese, xii 1053; of metallic tubes by extrusion.....xi 40
Progreso, mer. str., destruction by oil-fuel explosion.....xv 272
Progress: in marine machinery, vi 652; in steam navigation.—White, xi 904; in steamship construction, graphic record, xiv 570; of submarines during 1903.—Burgoyne, xvi 666; of the metric system in the United States, xii 469; of turbine propulsion.....xiii 168
Progressive speed trials: iv 587; advantages of.—McFarland, iii 150; in typical vessels, Br., results of.....iv 303
Progressive steam trials.—White.....xvi 306
Progressive trials.
Adder, xv 43; *Alabama*, xiv 181; *Arkansas*.....xiv 1172
Bainbridge, xiv 1003; *Bancroft*, v 204, 377; *Barry*, xiv 1003; battleships *Massachusetts*, *Alabama*, *Kearsarge*.....xiv 181
Cleveland, contractor's, xv 1110; *Chauncey*.....xiv 1003
Decatur, xiv 71; *De Long*.....xiv 825
Grampus.....xv 584
Hopkins, xv 694; *Hull*.....xv 694
Katahdin, screws, viii 1; *Kearsarge*.....xiv 181
Lawrence.....xv 667
Macdonough, xv 667; *Maine*, xvi 526; *Marietta*, ix 652; *Massachusetts*, xiv 181; *Moccasin*.....xv 43
Newport.....ix 557
Paul Jones, xiv 810, 812; *Perry*, xiv 797–9; *Pike*, xv 584; *Plunger*, xv 859; *Porpoise*, xv 859; *Preble*.....xiv 805, 808
Rodgers.....ix 684
Shark, xv 859; *Shubrick*, xiii 604; *Stewart*, xv 111; *Sunderland*, Br...ii 244
Truxtun.....xiv 1083
Vicksburg.....ix 557
Wheeling, ix 651; *Whipple*, xiv 1083; *Wilkes*, xiv 856; *Worden*, xiv 1083; *Wyoming*.....xv 83
Progressive trials, miscellaneous.
Argument for data of, v 113; general order No. 375, iv 589; methods of plotting curves, iv 587; of steam barge of commandant of New York Navy Yard.—Isherwood, i 1; discussion: Kinkaid, i 40; Mattice, i 33, 223; Spangler, i 37; Baird, i 40; of the Italian torpedo boat *Condor*, translation.—Durand, xii 77; of U. S. battleships, xiv 181; vs. measured course with turn.....iv 604
Projector burners, oil.....xvi 849
Prometheus, Br., dimensions, viii 391; trials, xi 326; xii 246; speed...xi 1103
Propeller-blade inaccuracies.—Smith.....xvi 911
Propeller blades and rudders.....xi 505
Propeller data.
Adder, xv 41; *Alabama*, xii 871; *Albany*, xii 301; *Albatross*, Fish Com. str., vi 506; *Alliance*, i 127; *Annapolis*, ix 563; *Arkansas*, xiv

Propeller data.
1180; *Arkansas*, *Florida*, *Nevada* and *Wyoming*, compared, xv 827; *Atlanta*.....iv 158, 402
Bainbridge, xiv 1011; *Baltimore*, i 340; iv 158, 402; *Bancroft*, v 369; *Barry*, xiv 1011; *Bennington*, see *Concord*, iv 158, 402; *Bergen*, ii 264; *Blakely*, xvi 1084; *Boston*, iv 158, 402; *Brooklyn*.....viii 751
Campania, mer. str., v 394; *Castine*, v 852; *Charleston* (old), i 314, iv 158, 402; *Chauncey*, xiv 1011; *Chicago*, iv, 158, 402; *Cleveland*, xv 1121; *Colorado*, xvi 1124; *Concord*, iii 93, iv 158, 402; *Columbia*, vi 22; *Cushing*.....iv 15, 158, 402
Decatur, xiv 64; *De Long*, xiv 832; *Denver*, xvi 75, 613; *Des Moines*, xvi 232; *Dolphin*.....iv 158, 402
Florida, xv 562; *Foote*.....ix 659
Grampus, xv 585; *Gresham*.....ix 260
Helena, ix 365; *Hopkins*, xv 702, 737, 739; *Hudson*, U. S. R. C., v 706; *Hull*.....xv 702, 729, 735
Illinois, 572; *Indiana*, vii 649; *Iowa*.....ix 465
Katahdin, viii 10; *Kearsarge*, xi 837; *Kentucky*, xii 11; *Korea*, mer. str.....xiv 389
Lawrence, xv 676; light-draught steam launch, speed and power trials, x 188
McCulloch, U. S. R. C., ix 717; *Macdonough*, xv6 77; *Machias*, v 852; *Maine* (old), vii 13; *Maine*, xiv 1132; *Manning*, U. S. R. C., ix 717; *Marblehead*, vi 134; *Marietta*, ix 645; *Massachusetts*, viii 250; *Medusa*, Br., i 255; *Meteor*, i 228; *Minneapolis*, vi 600, 722; *Missouri*, xv 1200; *Moccasin*, xv 41; *Monterey*.....v 125
Nashville, ix 580; *Nevada*, xv 106; *Newark*, iii 107, iv 158, 402; *Newport*, ix 553; *New York*.....v 623
Ohio, xvi 1049; *Olympia*, vi 248; *Oregon*.....viii 452
Parthenia, yacht, x 396; *Paul Jones*, xiv 784; *Perry*, xiv 784; *Petrel*, iv 158, 402; *Philadelphia*, ii 528, iv 158, 402; *Pike*, xv 585; *Preble*, xiv 784; *Protector*.....xv 1228
San Francisco, ii 543, iv 158, 402; *Shubrick*, xiii 595; steam cutters, U. S. Navy.....xiv 45
Tacoma, xvi 12; *Thornton*, xiii 595; *Tingey*, xvi 58; *Truxtun*, xiv 1090; Turkish torpedo boats, ii 118; typical ocean steamers, forty..vi 162
Vesuvius, iv 158, 402; *Vicksburg*.....ix 553
Wacouta, yacht, xiv 1161; *Wheeling*, ix 645; *Whipple*, xiv 1090; *Wilmington*, ix 365; *Winifred*, mer. str., x 988; *Wisconsin*, xii 990; *Worden*, xiv 1090; *Wyoming*.....xv 91
Yorktown, i 141, iv 158, 402; *Yosemite*, yacht.....vii 674
U. S. naval vessels.—Dyson.....xv 332 to 349
Propeller: efficiency, influence of shock on, iv 611; hubs, cast-steel, xi 446; of manganese bronze, i 220; problem, experiments on *Chateaurenault*, Fr., xiv 1230; shafting, novel method of installing, xii 326; shafts, diameter of, xii 451; shafts, frequency of failure..... xi 403
Propellers: *Amethyst*, *Sapphire*, *Topaze* and *Diamond*, Br., xvi 1254; *Baltimore*, changes in, ii 122; *Bergen*, double-screw ferryboat, ii 251; *County* class, Br., changes in, xvi 261; *Cushing*, slip of and calcula-

tions of power, iv 24; *Denver*, xvi 75; second trial, 613; *Donegal*, Br., xvi 631, *Leopard*, Aus., experiments with on, xvi 126; *Londonderry*, mer. str., xvi 631; *Nipsic*, damaged.....i 356
Propellers, miscellaneous.
Arrangement for high speed.—Rateau, xiv 648; bronze, painting, xvi 644; cast-iron, burning brass tips on, xiv 1225; direction of rotation, xv 1080; direction of rotation on twin-screw war vessels, xv 1175; effect of variation of elements, xv 286; factor in engine vibrations, iii 23; in- or out-turning effects of, iii 31; inboard-turning, *Cleveland*, xv 1136; inward- and outward-rotating, influence of on maneuvering qualities of twin-screw vessels, xvi 119; increased efficiency, xi 930; maneuvering and efficiency advantages of outboard-turning screws, xv 1177; negative slip, i 226; notching, due to vibrations, xv 753; outboard- and inboard-turning, xv 1080; outboard- and inboard-turning, vessels named by Laubeuf with each arrangement, xv 1176; outward-turning, boiler committee favors, xiv 874; outboard- vs. inboard-turning effect on maneuvering qualities of, xv 433; outboard-turning *Durandal* and *Hallebarde*, compared with inboard-turning *Pique* and *Epée*, xv 1183; progress in ten years, twin and triple screws, xiii 859; proportion for triple screws, xi 653; rotation of, xvi 95; rotation of, Labeuf, discussion of, xvi 95; twin, effect of direction of rotation, x 485; triple-screw ships, Fr., direction of rotation, xv 1184; specifications proposed, xvi 914; trials proposed for *Cushing*, iv 5; triple, iv 289; triple, see Triple Screws; U. S. Navy, ships, comparison.....iv 400
Propellers, screw: apparatus for ascertaining the efficiency of, v 970; a problem connected with, xv 887; arrangement of surface of, v 300; cavitation at high speeds, ix 678; cavitation of, *Turbinia* tests, ix 375; design not aided by experimental tanks, xv 969; Dickinson, v 300; experimental work, xv 514; for naval purposes, elements for efficiency, xv 637; for naval vessels, iv 157, 402; *Kaiserin Augusta*, Ger., trials, viii 627, 782; of U. S. naval vessels, xv 281; note on action of, i 124; study of an element of, iv 73; turbine, Thornycroft.....v 479
Proper sizes of pipes for hot-air house heating.....xii 503
Properties of nickel-steels.....xi 462
Properties and possible uses of nickel-steel.....xii 108
Proposed revision of the rules of the steamboat inspection service.—McFarland.....iv 210
Proposed steamers for the Canadian Atlantic service.....vi 642
Propulsion, economic marine.....iii 218
Propulsion, marine, application of compound steam turbines to.....ix 374
Propulsion, marine, calculation of horsepower.....viii 310
Propulsion, screw, for naval and maritime purposes.....xv 637
Propulsion, ship, advantages and disadvantages of rotary and reciprocating engines.....ix 569
Propulsion, ship, phenomena attending.....i 97, 223
Propulsion, some problems in.—Weaver.....i 59
Propulsive power of screw ships.—Warrington.....vi 259, x 88

Protected cruisers: comparison of, *Variag*, *Minneapolis*, *Olympia*, with *Terrible*, *Diadem*, *Blanco Encalada*, *25 de Mayo*, xii 1015; Ger., three, vii 828; *Nos. 6*, *7*, *8*, *9*, *10*, *11*, *12*, *13*, authorization and data, i 236; *No. 13*, des.....iii 258
Protection of iron from rust.....xi 448
Protection of steam-heated surfaces.—Norton.....x 708
Protective coatings for the immersed portions of iron vessels.....xiv 587
Protective power of paints.....xii 484
Protector, des., xv 1211; War Department report.....xvi 1304
Protée, Fr., data.....xiii 78
Protet, *Amiral*, Fr., dimensions, viii 189; data.....xiv 357
Proserpine, Br., des., vii 419; note, vii 815; launch, ix 168; coal consumption, x 858; trials.....xi 243, 326
Proserpina, Sp., note, ix 438; launch.....x 270
Psara, Gr., des.....ix 427
Psyche, Br., des., i 358; ordered, ix 804; launch, x 860; trials..xi 326; xii 246
Pueyrredon, Arg. Rep. (*Giuseppi Garibaldi III*), sold by Italy.....x 830
Pulleys, wood and iron, speed tests.....xii 1041
Pulverized coal as fuel.....xii 1075
Pulverized coal in stationary boilers.....xiii 174
Pulverized fuel.....xi 1068, xiii 168
Pumping engines: Blake, high-duty, Newton, Mass., v 465; digest of experiments, v 769, vii 215; new high-duty record, x 1090; test of boilers and, at New Bedford, Mass., v 769; Washington, D. C., duty and capacity tests.—Baird, i 41; Worthington, test of.....ii 26
Pumping plant, electric, for the salt-water aquaria, World's Columbian Exposition, Chicago, 1893.....iv 203
Pumping system.....iv 729
Pumps: air, vi 518; air, Bailey, tests, vi 768; air, circulating and feed, relation of power, revolutions and coal expenditure, iv 675; air and circulating, *Dolphin*, power required for, vii 135; air chambers on suction pipes, x 1119; centrifugal, v 295· centrifugal, form of vane, iii 558; centrifugal tests, xiii 719, xv 547; centrifugal, theory of, Part I, iii 335; Part II, iii 483; circulating.—Leopold, v 295; crank and direct-acting, steam-consumption trials, xiii 870; Davidson, valve gear, ix 385; De Laval, centrifugal, power, xvi 547; Dow, list of, *Oregon*, viii 461; feed: tests, xiii 722; hydraulic, *Maine* (old), vii 22; rubber, iv 203; steam, *Massachusetts*, list of, viii 256; list of, *Newport*, ix 554; list of, *Vicksburg*, ix 554; consumption tests, *Minneapolis*.....x 13
Purchase of second-hand boilers.....xi 195
Pure water for ice making.....xiii 208
Puri, mer. str., des.....viii 644
Puritan, authorization and data, i 236; reconstructed monitor, ix 525; steaming radius.....xiii 64
Puritan, mer. str., Fall River Line, hull data.....iv 849
Purves' ribbed flues.....iii 452
Purves furnaces.....vi 745
Pyramus, Br., dimensions, viii 391; trials.....xi 326, xii 246
Pyrometer, Le Chatelier, for testing temperature of molten metals.....x 1010

Q

Quadruple-expansion engines: causes preventing substitution of triple-expansion, i 153; data and performances, i 77; diameters of cylinders, i 150; steamers fitted with, i 77; of *Adria* and *Armenia*, viii 648; *Barbarossa* and *Bremen*, viii 861; *Comanche*, viii 207; *Elizabeth Rickmers*, viii 425; *Friedrich der Grosse*, viii 861; *Gedeh*, iv 864; *Inchmona*, viii 422; *Königen Luise*, viii 861; *Minneburg*, viii 428; *Pennsylvania*, viii 862; *Tantallon Castle*, vii 194; yacht.....viii 874
Quail, Br., launch, vii 820; launch and trials..... ix 172
Qualities and performances of recent first-class battleships.—White.....vi 464
Quarter, watch and station bills, engineer division.....xiii 930
Queen, Br., data, xiv 321, xiv 962; launch and des., xiv 652; trials, xvi 258, 340
Queen, hydraulic life boat, oil-fuel experiments on.....x 385
Queen Alexandra, turbine str., des., xiv 998; notes on turbine machinery .....xvi 891
Queen City, mer. str., note, viii 208; launch.....viii 651
Queen Olga, mer. str., arrangement of engines for low power.....vi 596
Questions: for engineer officers, examinations for promotion, i 93, 95, iv 462, 468; in Parliament.....vi 167
Quick, George, Fleet Engr., R. N.—Discussion, logical arrangement of the motive power of warships, xi 677; screw propulsion for naval and maritime purposes.....xv 637
Quick mobilization of a squadron.....xii 802
Quicksilver .....xii 1070
Quiggin evaporators.....vii 491
Quiros, Sp., launch.....vii 435

R

Racehorse, Br., launch xiii 282; trials.....xiv 208
Races: *America's* cup, 1893, v 998; of steam yachts in the Mediterranean, vi 440; *Sovereign*, yacht, with *Monmouth*, mer. str., viii 873; trial cup, 1901.....xiii 809
Racoon, Br., des.....i 171, 266
Radial paddle wheels, *Tartare*.....iv 580
Radial valve gears.....iii 525, xii 757
Radinger.—Formula for width of steam ports.....xvi 588
Radius of action of new cruisers.....iv 637, 658
Rae, C. W., Chief Engr., U. S. N.—Discussion, experimental station and engineer school.....vii 463
Rafale, Fr., des.....xiv 663
Raglan Castle, mer. str., launch.....ix 443
Rails, electric welding of.....xi 1079
Rails, steel, influence of copper on.....xiii 678
Railroad speed.....xiii 217
Railway rails, nickel-steel.....xii 520
Railway track, comparative cost in 1898 and 1899.....xii 213

Rainbow, evaporating plant, x 792; data.....x 824
Rainbow, Br., des. and trial.....v 211, 216
Rainha Amelia, Port., trials.....xiii 790
Raleigh, des., i 349, ii 416; speed curve, iii 556; launch, iv 293; cylinders, molding in loam and casting, iv 376; boring bar supports for stern tubes and struts, v 340; forced-draft trial, viii 298; steaming radius.....xiii 64
Ramapo, mer. str., launch and des.....viii 868
Ram cruiser *D*, Aus., des.....viii 161
Ramillies, Br., contract, des. and launch, iv 306; details, v 226; trials, v 515, vi 182; contract trial, v 739; gunnery trials, v 1041; compared to *Charles Martel*, Fr.....x 1200
Rammer, pneumatic, *Terror*.....ix 21
Ramming.....vii 57
Rams, water, in steam pipes.....iii 407
Ranger, test of French briquettes.....vii 578
Ranger, Br., trials.....viii 397
Ransom, G. B., Chief Engr., U. S. N., discussion, experimental station and engineer school.....vii 477
Rapid blue-printing processes.....xi 460
Rapid coaling: in the British Navy, x 206; of the *Iowa*, xii 222; of war-ships in port.....xvi 944
Rapid construction of ships, reasons for, and methods proposed.....x 150
Rapid corrosion of steel boiler tubes, physical reasons for.....vii 413
Rapid cruisers, *Nos. 1* and *2*, Fr., des.....vii 602
Rapière, Fr., data.....xi 800
Rateau steam turbines: xvi 210; trials, xvi 653; for marine purposes...xvi 647
Rateau.—Steam turbine propulsion for marine purposes.....xvi 647
Rating, boiler and smoke prevention.....xi 983
Ratings and qualifications of men.....xvi 1177
Rational design of combustion chambers and tube sheets for forced-draft boilers.....iv 787
Rational lubrication of marine engines, extracts.—Fontaine.....iii 571
Ratios, cylinder, for compound engines, xi 118; German naval vessels..xiv 18
Rattlesnake, Br., des.....i 171, 265
Ravenna, see *Scipio*.
Raynal, A. H.—Diagram for finding I.H.P., v 378; translation, triple-screw ships, xiii 397; translation, results of investigations on recent engines of the German Navy.....xiv 18
Rayner's evaporators.....vii 491
Raynhild, mer. str., trials.....vi 590
Reardon, W. J.—Foundry practice with copper and its alloys.....xvi 960
Rearick, Peter A., Rear Admiral, U. S. N.—Obituary.....xiii 326
Re-armaments and conversions of ships on the effective list.....xiii 617
Reavell, W.—Discussion: marine boilers, efficiency of combustion and higher steam pressure.....viii 774
Receivers of engines, discussion of.....iv 66
Receiver superheater, efficiency of.....xii 749

Recent advances in the manufacture of high-grade boiler and pipe material.....xi 1
Recent investigations concerning dynamical action in shafting of marine engines, with special reference to synchronous torsional vibrations. —Frahm.....xiv 721
Recent naval maneuvers, France, 1891.....iii 599
Recent performances of the U. S. S. *Oregon*, 1898.—King.....x 621
Recent trials of the cruiser *Diadem*.—Durston, x 425; discussion: Seaton, 435; Allen, 437; Gray, 437; Sawyer, 438; Yarrow.....438
Recent trials of French cruisers, 1895.....vii 150
Recent trials of the machinery of British war ships, 1899.....xi 304
Reciprocating engines and turbines combined.—Rateau, xvi 652; and turbines, steam-consumption test, xvi 1279; comparison with turbines, xvi 630; marine vs. rotary, advantages and disadvantages.....ix 569
Reciprocating parts and angularity of connecting-rod, method for determining influence.....i 271
Recoil system, pneumatic, *Terror*.....ix 22
Record, continuous, of performance of a marine engine, method of determining.....ix 1
Record in ore unloading.....xvi 1302
Records of an experiment to determine the evaporative efficiency of a brand of French briquettes.....vii 578
Reconstructed American monitors.—Bennett.....ix 525
Reconstruction of a drydock.....xii 166
Recruit, Br., data, vii 820; launch, viii 841; trials.....xiii 271
Red D Line steamers, des.....vii 436
Red-hot furnace-crown experiments, iii 223; conclusions, iii 228; discussion.—McKean.....iii 431
Reed boilers: destroyers, Br., *Janus*, viii 797; compared with others, xiv 426; ships fitted with, xiv 502; in navies, xvi 292; *Sapphire*.....xvi 1246
Reed feed-regulator and boilers, *Porcupine*, Br.....viii 398, 839
Reed, M. E., Lt., U. S. N.—*Maine*, progressive trials.....xvi 526
Reed, Sir Edward J.—On the advances made in the mathematical theory of naval architecture, etc.....ix 730
Rees, W. D., mer. str., launch.....viii 209
Refrigerating machinery, iv 783; Allen dense-air ice machine.....iv 771
Refrigerating plants: *Minneapolis*, vi 725; *Oregon*, test, viii 465; service defects, xiv 16; tests of.....xii 142
Regarding effect of compression in steam cylinders on economy.—Ball, xii 764, xiii 104
Regarding useful information.—Willits.....xvi 1157
Regele Carol I, mer. str., des.....x 927
Regina Elena, It., data, xiii 299; launch.....xvi 764
Regina Margherita, It., launch and des., xiii 789; launch, xiii 1115; trials and des.....xvi 1332
Register for speed trials.—Weaver.....iii 86
Registered tonnage, Great Lakes, 1891.....v 144, 154
Registry and survey of shipping.....v 661

Regulation of an electric lighting station.....vi 571
Regulation, Navy, circulars Nos. 52 and 53, examinations of engineer officers, i 93-95; rescinded, replaced by Nos. 109, 110, iv 462-468; affecting engineer division.....xvi 1195
Regulations, petroleum, Suez canal.....iv 107
Rehber, Tur., launch.....vi 810
Reheaters in multiple-cylinder engines.—Thurston.....xii 385
Reheaters, proper design of.....xii 400
Reina de los Angeles, mer. str., launch, viii 427; speed.....viii 652
Reina Maria Christina, des.....i 168
Reina Regenta, Sp., performance data.....v 504
Reindeer, mer. str., des.....ix 836
Relation of the duties of the naval engineer officer to the "Problem."—Edwards.....viii 21
Relative corrosion of various metals.....xi 1044
Reliability of "throttling calorimeters."—Denton.....viii 98
Remarks on steam pipes.—Milton.....vii 522
Remarks on the increasing frequency of failure of propeller shafts.....xi 403
Remarkable economy test of a large cotton-mill engine.....x 665
Reminiscences of early marine steam engine construction and steam navigation in the United States of America from 1807 to 1850.—Haswell.....x 949, xi 373
Renan, Fr., named.....xiv 669
Renard, Br., details, v 226; trial, v 1061; des. and trial.....vi 200
Renewing lignum vitae linings.....xiv 529
Renown, Br., des., v 487, 515, viii 163; launch and des., vii 427; trials, viii 387, xi 318; boiler weights.....viii 641
Repairing a broken valve chest on the *Concord*.—Norton.....vi 761
Repairing of the *Umbria's* shaft.....v 185
Repair of the torpedo-boat destroyer *Salmon*.....xiv 564
Repair ships: vii 71; *Ohio*, tools for, vii 72; a military auxiliary to the naval fleet in peace and war.—Bartlett.....xiv 1031
Repair shop, floating, *Vulcan*, Br.....iv 820
Repair stations, engineer division.....xiii 925, xvi 1182
Repairs to vessels at Cavite.....xi 1042
Repairs, see Casualties and Repairs, and Breakdowns.
Repairs and casualties, notes.....i 88
Repairs, valve chest, *Concord*.....vi 761
Reply to Chief Engineer Isherwood, U. S. N., on analysis of engine trials.....iii 65
Reply to Mr. Isherwood.—Ball.....xiii 104
Report concerning the design, installation and operation of the turbine engines of S. S. *Revolution*.....xv 1241
Report, interim, of Admiralty boiler committee.....xiii 353
Report of Liquid-Fuel Board.....xvi 719
Report of a six-day trial of the "Lillie" multiple-effect distilling plant at Dry Tortugas, January 13 to 20, 1900.—Crank.....xii 85
Report of board of U. S. naval officers on boilers of U. S. S. *Maine*....xv 951

Report of board to observe and report concerning the efficiency of turbine engines.....xv 1247
Report of Admiralty boiler committee, 1892.....v 586
Report of British Admiralty committee on naval boilers.....xiv 866
Report of the boiler committee on the trials of the *Hyacinth* and *Minerva*, xiii 1004; 2nd.....xiv 458
Report of the committee on naval boilers, Br.....xvi 918
Report of Cunard turbine commission.....xvi 634
Report on the performance of the S. S. *Meteor*.....i 227
Report on torpedo boats and destroyers.—Linnard-Chandler.....xiv 282
Reports on turbine installation: *Lorena*, *Tarantula*, *Turbinia*.—Canaga-Jansen.....xvi 1095
Report upon trials of three steamers, *Fusi Yama*, *Colchester*, *Tartar*.—Kennedy.....ii 340
Republica, Brazil, launch and des.....iv 527
République, Fr., launch.....xvi 348
Repulse, Br., details, v 226; contract trials, v 512; trials.....vi 182
Request of contractors building torpedo boats and destroyers.....xiv 295
Requin, Fr., data, xiv 330; reconstruction.....xiv 669
Research Committee, Institution of Mechanical Engineers, report on trial of *Ville de Douvres*, mer. str.....iv 409
Resemblances between animate and inanimate matter.....xii 200
Reserve torpedo-boat flotilla, care and preservation.....xv 756
Resistance and distortion of flat heads.....x 660
Resistance and propulsion of ships.—Durand, book received.....x 618
Resistance, frictional, of bearings.....ix 104
Resistance of ships and screw propulsion.—Taylor, book received.....v 1094
Resistance of ships, hydraulics of.....xiv 555
Resistance of train.....xi 202
Resistance, water, to motion of ships.....xvi 306
Resolute, auxiliary navy, x 538; data, x 824; des.....x 827
Resolution, Br., details, v 226; trial, v 1039, vi 182; evaporator explosion, vi 168; des., vi 188; behavior at sea, vi 482; effect of bilge keels, vii 539
Restauracion, Santo Domingo, launch.....viii 638
Restless, auxiliary navy, x 538; data.....x 824
Results of investigations on recent engines of the German Navy, translation.—Raynal.....xiv 18
Retarders and "Serve" tubes, induced draft and hot air combined, in boilers fitted with.....v 828
Retarders: effect of in fire tubes of steam boilers.—Whitham, viii 779; use of in Scotch boilers.....viii 777
Retribution, Br., des. and trial.....v 211, 216
Retvisan, Rus., data, xi 534; des., xi 1114; launch and des., xiii 306; des. and trial.....xiii 1121
Re Umberto, It., des. of machinery, viii 410; trials.....vi 207, viii 195
Revealer, glass, for studying condensation.....xii 998
Revenge, Br., launch and des., v 223; details, v 226; ordnance trials, vi 168; trials, vi 182; des., vi 188; rolling experiments, vii 541; coal consumption.....xiii 1029, 1031, 1032

Revenue cutters: *Hudson*, trial, v 703; *No. 3*, bids, viii 160; *Nos. 4* and *5*, des., ix 404; *No. 6*, bids, ix 794; *Nos. 9* and *10*, bids, xiii 1087; new, vii 561; new, 1900, bids, xii 556; see naval vessels marked "U. S. R. C."
Revenue steamer, *William Windom*, des.....v 988
Reversing engines, auxiliary engines, etc.....iii 585
Reversing in steam turbines.....x 522
Review and experimental test of the steam plant of the S. S. *Iroquois*.—Selden.....vi 445
Review of marine engineering during the past ten years.—McKechnie, xiii 827
Review of water-tube boilers now used for marine purposes with a comparative reference to the ordinary cylindrical type.—Jansen.....xiv 409
Revision of the boiler laws of the U. S. steamboat inspection service.—Mier.....xv 382
Revision proposed for steamboat inspection service rules.....iv 210
Revolution, mer. str., report on turbines.....xv 1241, xvi 174
Revolution recorder, Weaver's, on trial of *Bancroft*.....v 377
Rhaetia, see *Cassius*.
Rhein, Ger., Dürr boilers.....xiii 881, 901
Rhode Island, launch.....xvi 678
Ribbed flues, Purve's.....iii 452
Richards, Frank.—What is the efficiency of an air compressor?.....x 1034
Richard Peck, mer. str., des. and trial.....iv 857
Ridsdale, C. H.—Correct treatment of steel.....xiv 138
Riedler-Stumpf, turbine installations.....xvi 217
Right Arm, see *Pontiac*.
Rights of shop inventors in Germany.....xii 519
Rinaldo, Br., trials, xiv 206; speed.....xiv 321
Rindjani, Hol., trials.....xiii 785
Ringdove, Br., trial.....ii 422
Rio de Janeiro, mer. str., wreck.....xiii 542
Rio de la Plata, Sp., data.....ix 825
Risdon Iron Works.....xii 1081
Ristori, E.—Manufacture of aluminum.....x 755
Rivadavia (*Kasuga*), Jap., purchase and des.....xvi 364
River gunboats, light draught.....x 783
Rivets, boilers, standard dimensions.....iii 421
Rivets, nickel-steel.....x 1038
Riveted joints: boilers, formulae for strength of, viii 269; formulae for, iv 403; in thin plates, tests, xii 1080; tests at Watertown Arsenal for Bureau Steam Engineering, iv 624; tests at Watertown Arsenal, Mass., viii 727
Riveted seams, troubles with in boiler construction.....v 894
Riveting, effect on basic steels, Bessemer and open-hearth.....iv 448
Robert Fulton, mer. str., launch.....viii 864
Robert W. Wilmot, mer. str., des.....x 600

Robison, John K., Lieut., U. S. N.—Tubulous boilers in the French Navy, vii 365; water-tube boilers a necessity—a war lesson, x 996; reply to discussion, xi 38; contract trial of the United States battleship *Wisconsin*.....xii 979
Robinson, Leslie.—Discussion: calculation of power for marine propulsion, viii 317; discussion, water-tube boilers.....viii 509
Robinson, Mark H.—Discussion, compound marine steam turbines .....ix 382
Rocket, Br., launch, vi 805; trials, vii 423; machinery and trials, breakdowns, viii 175, 179; breakdown .....viii 621
Rockwood, George I.—Cylinder ratios for compound engines .....xi 118
Rodgers, torpedo boat *No. 4*, progressive trial, accidents, ix 684; trials, xi 892; speed, x 534; data, x 818; full data.....xiii 1082
Rodney, Br., des.....i 170, 265
Roebuck, Br., trials.....xiv 208
Roebuck, mer. str., des.....ix 836
Roelker, C. R., Rear Admiral, U. S. N.—Notes on coals of the Pacific coast, i 69; supports for boring bars for stern tubes and struts, v 340; forced-draft trial of *Raleigh*, viii 298; translation, influence of inward- and outward-turning propellers on the maneuvering qualities of twin-screw vessels.....xvi 119
Roland, mer. str., trials.....v 1077
Roller boat, Knapp.....xi 210
Roller steamer *Ernest Bazin*, des. and launch.....viii 870
Rolling experiments, *Revenge*, Br.....vii 541
Rolling mills and foundry for manufacture of aluminum at Milton, Staffordshire.....x 755
Rolling of battleships, vi 474; of ships in squadron, Br.....vi 477
Rona, yacht, des.....vi 221
Roney mechanical stokers, power plant, Navy Yard, N. Y.....xiii 985
Rope driving.....xi 133
Rope making at Charlestown Navy Yard.....xiii 219
Rosabelle, yacht, des.....ix 448
Rosales, Arg. Rep., des.....iii 285
Rosario, Br., dimensions, ix 804; trials .....xii 564, xiii 274
Rosenthal.—Discussion, cylindrical vs. water-tube boilers.....vi 397
Ross, H. Schuyler, Chief Engr., U. S. N.—Discussion, experimental station and engineer school.....vii 475
Rossia, Rus., to have triple screws, vii 433; launch and des., viii 637; accident to, ix 186; floated after grounding, ix 433; trials .....ix 822
Rostilav, Rus., launch and des.....viii 853
Rotomahana, mer. str., trials.....vi 590
Rotation of propellers: in- or out-turning, iii 31; direction of, xv 1080; on twin-screw war vessels, direction of, xv 1175; McKean, xvi 95; Laubeuf, discussion.—McKean, xvi 85; White.....xvi 119
Rotary converters: electric-power transmission, xiv 821, 1119; metallic brushes for.....xii 496
Rotary vs. reciprocating marine engines, advantages and disadvantages.—Parsons.....ix 569

Rotch, Wm.—Tests of pumping engines and boilers, New Bedford, Mass., i 299, ii 26
Rotterdam, mer. str., dimensions....viii 208
Rounthwaite.—Discussion, Yarrow's feed-water heater....x 419
Routine work of engineers' division of naval vessels.—Dinger....xvi 1164
Rowan, torpedo boat *No. 8*, data, x 818; trials, xi 892; full data....xiii 1082
Roxburgh, Br., combination boilers, Dürr and cylindrical, xiv 921; launch and des....xvi 344
Royal Arthur, Br., des., iii 263; coal consumption, vii 347; Callao to Coquimbo....xii 736
Royal naval engineers' note book, the.—Harvey, book received....i 89
Royal Navy list, book received....xvi 1026
Royal Oak, Br., launch and des, v 221; trials, vi 182, 187; des.. ....vi 184
Royal Sovereign, Br., des., iii 261; des. and trials, iv 295; trials, vi 182; rolling of, vi 476; coal consumption, vii 347; performances under steam, vi 489, 493; machinery data....xi 330
Royal Sovereign class, Br., qualities and performance, vi 464; rolling experiments....vii 538
Royal Technical High School, Berlin, mechanical laboratory....xv 1040
Royalties paid for Belleville boilers....xiii 456
Rubber hose, strength of....xii 154
Rubber pumps....iv 203
Ruby, Br., des....i 266
Rudder, pneumatic system for *Terror*....ix 23
Rudders, special form, *Daring*....vii 718
Rules for steamboat-inspection service, proposed revision....iv 210
Rules for treatment of boilers....iv 696
Rumley, J. Mair.—Discussion, determination of dryness of steam....vii 324
Run: of cruiser squadron, Br., xvi 622; of the U. S. S. *Castine*, ix 125; of the *Columbia*, vii 567; transatlantic, of the U. S. S. *Bancroft*, ix 126; the *New York*, vii 571; the U. S. S. *Petrel*, viii 581; of the *St. Paul* and *St. Louis*....viii 588
Runic, mer. str., launch....xii 1122
Running lines for shafting and boring out stern tubes and bracket bearings, *Cincinnati*....v 1
Rupert, Br., des....i 265
Rurik, Rus., work on, ii 425; des., iii 605; des. and launch, v 228; des. and trials....vii 433
Rush, data....x 534
Russée, Fr., des....vii 173
Russell, Br., launch and des., xiii 476; trials....xiv 657, 963, xvi 260
Russia: naval construction, 1904, xvi 366; new ships, 1899, xi 531; petroleum industry, xii 1076; war fleet, xvi 316; zinc production, xii 1084; cruiser *Novik*, 25 knots, xiii 1052; electric launch, x 896; experimental tank, v 194; fast torpedo boats for, Schichau, iv 845; ice crusher, data, x 1222
Russian Navy, 1901, xiv 679; economizers in, xiii 202; Belleville boiler installation, xvi 445; Niclausse boiler installations, xv 1172; water-tube boilers....xii 745
Rusting of iron....xii 1064

S

S26, Ger., capsized.....ix 817
Saale, mer. str., burning of, xii 843; data.....xiii 542
Sabine, mer. str., launch.....xiii 315
Sabin, Japan, for iron water pipes.....xi 946
Sabre, Fr., trials.....xvi 1011
Sabyholin, mer. str., trial.....vi 590
Sachsen, Ger., data compared with triple-screw, xiii 404; Dürr boilers, xiii 901, xiv 117; coal-consumption and boiler, Dürr, data.....xiv 117
Sadler, Prof. H. C.—The problem of building war ships on the Great Lakes.....xv 458
Safety to men.....iv 745
Safety valves, steamboat-inspection rules.....iv 230
Sag of steel wire, method of measuring.....ix 726
Sahara, mer. str., launch.....xvi 712
Sailing vessels, large, *France*.....iv 290
Sailors, scarcity of.....xii 176
Sail power for our new Navy.....iv 799
St. George, Aus., launch.....xvi 335
St. George, Br., details, iii 134, v 226; trial and des., vi 198; overhaul of, xvi 690
St. Louis, data, xii 822; characteristics, xii 1086; compared to the *Prinz Heinrich*.....xiv 334
St. Louis, mer. str., launch and des., vi 811; machinery data, vii 609; trials, vii 843; run of, 1896, viii 588; data, x 534, xiv 1272; record, 1900, xii 263
Saint Louis, Fr., des., vi 427; launch and dimensions, viii 847; note..xiii 292
St. Louis exposition power plant.....xvi 1139
St. Paul, mer. str., trials, vii 843; rupture of stop valve in main steam pipe, viii 155; run of 1896, viii 588; data, ix 835, x 534, xiv 1272; crack in steam pipe, xi 231; propeller accident xii 1121; steaming radius...xiii 66
Sainte Marie, mer. str., car ferry.....v 759
Salamander, Br., boiler change.....viii 620
Sale of condemned vessels.....xii 240
Salmon, Br., trials, vii 817; machinery, viii 844; repairs.....xiv 564
Saltar, John, Jr.—Gasoline engines for Holland submarine torpedo vessels *Nos. 3* to *8*.....xiii 144
Salt-water feed for Yarrow Express boilers.....ix 388
Salt-water detector.....xii 525
Samoa, largest cargo steamer, launch and des.....iv 867
Samoa, lessons from.—McKean.....i 209
Samoyede, Rus., des., vii 607; trials.....vii 840
Sampson.—Discussion, cylindrical vs. water-tube boilers.....vi 407
Samson, mer. str., des.....xiii 315
Sandfly, Br., bad sea-going qualities, i 89, des., i 171, 265; trials, i 179; repairs to.....iii 599
Sandison, Magnus.—Discussion, logical arrangement of the motive power of warships.....xi 663
Sandy Point coal, notes on.—Roelker.....i 71

San Francisco, authorization and data, i 236; launch, i 335; boilers, ii 141; work on, ii 413; des. and contract trial, ii 537; power of auxiliary machinery, iii 217; engine and boiler data, iii 422, iv 652; propeller data, iv 158, 402; coal endurance, iv 665; boiler weights, iv 703; air-pump data, vi 532; screw trials, ix 139; steaming radius, xiii 66; coal consumption.....xv 366, 379
San Gabriel, Port., launch.....x 894
Saniter, E. H.—The elimination of sulphur from iron.....iv 757
Sankey, Captain.—Discussion, determination of the dryness of steam, vii 320
San Martin, Arg. Rep., launch and des.....viii 605
Sanspareil, Br., trials, i 84; repairs, vi 197; coal consumption, vii 347, xiii 1029, 1031, 1032
Santa Fé, Arg. Rep., launch and des., viii 609; data .....ix 141
Santiago, des.....i 363
Santiago, naval battle of.....x 746
Sapphire, Br., launch and des., xvi 687; compared with *Amethyst* turbines.....xvi 1242
Sappho, Br., trials, iv 830; des. and trials.....v 218
Saranac, yacht, des.....x 933
Sardegna, It., trial, vi 620; des.....vii 173
Sarrasin, Fr., boiler explosion.....vi 166
Satellit, Aus., des., vi 423; comparison of boilers with *Speedy*, Br., vi 394; note on.....vi 619
Saturn, data, x 534; steaming radius.....xiii 66
Sault Ste. Marie canal, data.....v 143
Savoie, mer. str., launch.....xii 581
Sawyer, Frederick.—Discussion, recent trials of the cruiser *Diadem*.....x 438
Saxonia, mer. str., launch xii 268; data, compared with *Hyacinth* and *Minerva*, Br., xiv 460; boilers.....xvi 919
Sazanami, Jap., des.....xii 257
Scale in boilers.....iv 685
Scantlings of ships' bulkheads .....iv 787
Scarcity of sailors.....xii 176
Schell, F. J., Past Asst. Engr., U. S. N.—Formulae for proportioning riveted joints and calculating the width and thickness of butt-straps for steel boilers.....iv 403
Scheme for the rapid analysis of boiler waters for scale-forming ingredients.....x 1117
Schichau high speed-torpedo boats for Italian and Russian Navies.....iv 845
Schichau boilers: in *Kassarsky*, Rus., compared with Thornycroft boilers in *Geiser*, Den., v 170; ships fitted with, data.....xiv 504
Schlick, Herr Otto.—The vibration of steamers.....xiii 428
Schlick: quadruple expansion engines, *Longmoon*, mer. str., viii 655; arrangement of cranks, German naval vessels.....xiv 23
Schlick-Tweedy (Yarrow) system of balancing engines.....x 481
Scholt and Gen's new composite gauge glasses.....v 192
Schulz boilers: *Nymphe*, *Wurttemberg*, Ger., xiv 117; compared with others, xiv 421; in navies, xvi 292; ships fitted with, data.....xiv 504

Schwaben, Ger., launch, xiii 1097; des.....xvi 359
Schwarz, G.—Investigation of the stresses on frames of vertical, inverted steam engines.....xv 19
Schwoerer's superheater, des. and tests.....viii 365
Scindia, mer. str., trials.....vi 590
Scindia, auxiliary navy, x 538; data, x 824; steaming radius.....xiii 66
Scipio, data.....x 824
Scorpion, data, x 534; steaming radius.....xiii 66
Scot, mer. str., data.....vi 162
Scotch boilers, tests, ii 170; diagram, ii 418; use of retarders in.....viii 777
Scotia, mer. str., data.....vi 162
Scott, John.—Discussion, transmission of heat through tube plates.....v 460
Scott, J. Alvah.—The submarine torpedo boat *Plunger*, x 366; discussion, water-tube boilers.....x 627
Scottish Hero, mer. str., des. and trial.....vii 852
Scout cruisers: bids for building, 1904, xvi 1314; three, 3,750 tons, appropriation 1904, *Birmingham*, *Chester*, *Salem*.....xvi 334
Scouting, sea.....xvi 670
Scouts: Br., new, xvi 985; Br., cost compared, xvi 988; fast, design for..xvi 412
Scout vessels: xvi 673; *Linois*, Fr., des.....iv 842
Scow, screw, gas engine for.....vi 415
Screw data of vessels of U. S. Navy.....vi 765
Screwed joints in fire space of water-tube boilers.....x 636
Screw propellers: action, note on, i 124; arrangement, *Chevalier*, Fr., vi 586; Dickinson, v 300; White, xvi 307; study of the element of, iv 73; apparatus for ascertaining the efficiency of, v 970; arrangement of surface of, v 300; a problem connected with, xv 887; at high speeds, cavitation, ix 678; experimental work, vii 726, xv 514; of U. S. naval vessels.—Dyson, xv 281; of U. S. naval vessels.—Webster, iv 157; outboard- and inboard-turning, xv 1080; triple, *Minneapolis*.....vi 599
Screw propulsion for naval and maritime purposes.—Quick.....xv 637
Screws: in-turning, *Formidable*, Br., xiii 1082; in-turning vs. out-turning, xv 433; triple, iv 289; triple versus twin, x 1126; twin, effect of direction of rotation, x 485; Whitworth's.....xii 481
Screw: ships, propulsive power of, vi 259; steamers, causes of vibrations of, iii 12; threads, metric, international standard for, xi 206; turbine propeller, Thornycroft.....v 479
Scribner, E. H., Comdr., U. S. N.—*Colorado*, description and official trial, xvi 1118
Scud, yacht, des., viii 662; boilers.....viii 874
Scylla, Br., des. and trials.....v 218
Seabury boiler, water-tube: x 774; *Bailey*, xiii 1082; *Wilkes*, xiii 1082; *Stewart*.....xiii 1082, xv 114
Seaford, mer. str.. des.....vi 838
Seagoing battleship *No. 1*. des.....iv 811
Seagull, Br., accident to, iii 457; boilers, viii 172, xvi 920; trials, ii 234, v 715, xii 246, xii 562, xiv 964; horsepower.....xii 252
Seal, Br., launch, ix 421; trials.....x 237

Seamless steel boiler tubes: physical properties, xv 431; their limited endurance a menace to naval efficiency.—Mansfield.....xv 417
Seams: for cylindrical boilers, formulae for strength of, viii 269; riveted, troubles with in boiler construction.....v 894
Searchlights in the ice.....xi 507
Sea scouting.....xvi 670
Sea speed, sustained, of new cruisers.....iv 644
Seaton, Albert Edward.—Discussion, transmission of heat through tube plates, v 461; discussion, cylindrical vs. water-tube boilers, vi 387; remarks on lightest form of engine columns, vii 364; discussion, watertight doors, viii 341; discussion, logical arrangement of motive power of warships, xi 665; use of water-tube boilers in the mercantile marine, ix 667; discussion, recent trials of the cruiser *Diadem*.....x 435
Seaton and Roundthwaite's pocket book of marine engineering rules and tables, book received.....vi 443
Seaton boiler.....vi 363
Seaton-Cunningham method of coaling at sea.....xv 1057
Sea trials of H. M. S. *Hyacinth* and *Minerva*, report of the boiler committee.....xiii 1004
Sea water, tests of.....x i
Sea water, endurance of copper alloys in.....xi 336
Sebago, former *Takoma*.....x 240
Second-class cruisers, Br., des.....iii 596
Second report of the boiler committee on the trials of the *Hyacinth* and *Minerva*.....xiv 458
Second trial U. S. S. *Baltimore*.....ii 122
Sed-ul-Bahr, Tur., launch.....vi 810
See, Horace.—Discussion, trial trips and the lessons to be learned from them.....iii 164
Segregation and crystallization of cast-iron.....xi 1001
Seguranca, launch.....ii 429
Seid, torpedo boat, trials.....vi 590
Seine, mer. str., des.....vi 635
Selden, W. C.—Review and experimental test of the steam plant of the S. S. *Iroquois*.....vi 445
Selection of the most suitable form of vane for centrifugal pumps.—Bartl.....iii 558
Self-docking steel floating drydock, Cavite.....xv 472
Self-lubricating high-speed steam engines.....ix 689
Self-starting single-phase motor.....xi 1076
Semi-bituminous coal: test in *Cushing*, iv 36; Eureka, Clearfield, Pa., analysis.....x 113
Seminole, data.....x 824
Semi-steel.....x 772
Senator, mer. str., launch, viii 652; des.....ix 834
Senior engineer, duties of.....xvi 1169
Sentinel, Br., launch and des.....xvi 686
Sentinel, *Skirmisher*, Br., scouts.....xvi 985

Separators, steam, efficiency of.....iii 591
Sequence of cranks, German naval vessels.....xiv 18
Series field windings of compound dynamos.....xii 178
Serpent, Br., des.....i 171, 265
Serpollet boiler and superheating steam.....iii 588
Serve's ribbed boiler tube.—Willits.....iii 345
Serve boiler tubes: iv 288, iv 745; comparative trial of boilers with ordinary and, ii 569; tests, vi 785; and retarders, induced draft and hot-air combined, in boilers fitted with, v 828; *Inchdune* and *Inchmarlo*.....xiii 156
Servia, mer. str., dimensions and data, iv 102; data.....vi 162
Service and longevity of modern steamers.....v 1029
Service of the boilers of the S. S. *Sindh* of the Messageries-Maritimes, iii 253
Sevastopol, Rus., horsepower, xii 260; data.....xiii 307
Seyd-i-Deriah, Tur., launch.....vi 810
Sfax, Fr., defects in.....iv 315
Shaft, crank, forgings, steel.....iii 1
Shaft, crank, solid, fitting up.....iii 328
Shafting: alignment of and boring stern tubes, Union Iron Works, v 7; broken, *Trave*, mer. str., v 188; *Umbria*, v 185; preserver, v 712; outboard, of *Columbia*, *Normannia* and *City of Paris*, mer. strs., weight and dimensions, vi 306; failure from fatigue, v 1027; preservation of, i 364; dynamical action of, in marine engines, xiv 721; forgings, marine, notes on, xiv 226; hollow steel, ix 84; data and physical characteristics, ix 96; lining up, ix 726; Lloyd's rules for, changes in, xii 794; method of running lines for, *Cincinnati*, v 1; power losses, xii 119; propeller, novel method of installing, xii 326; for transmitting power on shipboard.....iv 176
Shafts, crank: advantages of built-up over solid-forged, i 134; fitting up *Newark's*, iii 9; stresses in, viii 665, ix 42, ix 318, ix 482; equivalent hollow and solid, relations, vii 507; propeller, increasing frequency of failure, xi 403; torsional vibrations of.....xiv 432
Shaking grates vs. ordinary.....xiv 7
Shakspeare, mer. str., trials.....vi 590
Shallow-river navigation, improvements on.....xiv 1029
Shannon, Br., des.....i 265
Shark, named, xii 825; data, xiii 476; contract trials.....xv 859
Shark, Br., preliminary trial, vii 170; trials, vii 423; machinery and trials, viii 175
Sharpshooter, Br., trials, i 262, xii 822; des., i 265; trial failure, i 357; defects in 1892 maneuvers, iv 838; repairs, vi 202; Belleville boilers, v 1031, vi 414; boiler trials, vi 591, vii 601, 822, viii 379; data, vi 804; Belleville boiler trial, viii 379; coal consumption.....vii 416
Sharpshooter class, Br., *Sheldrake*, *Skipjack*, *Spanker*, *Speedwell*, trials and defects.....ii 234
Shawmut, mer str., launch and des.....xiv 371
Shearwater, Br., data, x 824; launch, xii 563; trials.....xiii 274, 283

Sheathing: copper, galvanic action of, xii 1061; for vessels, vii 56; of warships.....xiii 452
Shefket Numa, Tur., launch.....vi 810
Sheikh, Egypt, des.....ix 798
Sheikh, Br., speed.....x 230
Sheldrake, Br., changes in, ii 234; trials, xi 250, 1104; boilers.....xvi 920
Shell fire, effect on petroleum tanks.....v 486
Shells, illuminating.....xi 505
Shiebler, A.—Steam plant of Iroquois.....vi 446
Shikishima, Jap., data, x 580; launch and des., x 1203; des..xi 1112, xiv 345
Shipbuilding: and mechanical engineering, xi 744; at Nagasaki, x 1113, xi 190; Denmark, xi 1039; in the United States, v 159; program, England, v 486, vii 145; program, France, v 749, vii 146; 1892, iv 843; 1893, iv 521; 1901, xiii 495; for Japan in Europe, x 267; plant, Risdon Iron Works, xii 1081; works, arrangement and equipment.....xiii 947
Shipping data, Great Lakes.....v 144
Shipping, survey and registry of.....v 661
Ships: construction, special steels for, x 203; conversions and re-armament, xiii 617; electric lighting of, iii 510; lighting plant, iv 802; fittings, novelties in, xi 1058; propulsion, phenomena attending, i 223; bulkheads, scantlings of, iv 787; speeds of, effect of shoal water on iv 329; economical limits of, xiii 661; triple-screw, xiii 397, 690; United States, classification according to displacement, vi 113; see Naval Vessels, Merchant Steamers, Yachts.
Ship yards, improvements in.....x 1115
Shipyard building slips with overhead crane and staging arrangements, xi 1054
Shirakumo, Jap,, launch, xiii 1119; trials, xiv, 358; note.....xiv 678
Shoal water: effect of on speeds of ships, iv 281, 329; effect of on speed trials.....iv 601
Shock, influence on propeller efficiency.....iv 611
Shops and fittings for repair ships.....xiv 1071
Shrink and force fits.—Wilmore.....xi 106
Shrinkage, in fitting built-up crank-shafts.....iii 9
Shubrick, torpedo boat, No. 31, named, x 818; launch, xi 1088, xiii 474; installing propeller shafting, xii 326; contract trial, xiii 586; full data, xiii 1082
Shunlee, mer. str., trials.....vi 590
Siberia, mer. str., des., xiii 317; data.....xiii 1142
Sicilia, It., launch, iii 604; trials, viii 195; machinery, viii 410; combustion tester of.....viii 583
Siegfried, Ger., coal-consumption and boiler data.....xiv 116
Sierra, mer. str., data.....xiii 319
Sigaudy-Normand boilers, see Normand-Sigaudy boilers.
Signaling, submarines.....xiii 212
Signals, engine room.....iii 197, iv 743
Sigurd, mer. str., trial.....viii 656
Silicon: effect in cupola practice, x 1045; effect on malleable cast iron, xi 163; nickel, and chromium-steels, special, xi 144; -bronze, iii 498; -steel.....iii 507

Silure, Fr., effect of gases while submerged, xiv 968; submerged 140 feet, xiv 609
Similar structures and machines....xi 976
Similitude, laws of in naval construction....vii 284
Simple and triple-expansion engines compared.—Isherwood....v 271
Simple copying process....xi 774
Simple graphic method of considering the obliquity of connecting rods in valve diagrams.—Guy....v 991
Simultaneous indicator cards by electrical connection....iii 161
Sinclair's superheater, des....viii 368
Sindh, mer. str., service of boilers, iii 253; Belleville boilers....viii 152
Single-cylinder and triple-expansion engines compared.—Isherwood....v 271
Single-cylinder engines, jacketed, economic efficiency....v 277
Single eccentric valve gears....iii 531
Sinking of H. M. S. *Victoria*....v 693, vi 47
Sinking of the *Charleston*....xii 203
Sinope, Rus., trials....ii 236, 424
Sioux, data....x 584
Sir Christopher Furness, yacht, note....xiv 1002
Sirdhana, trials....vi 590
Siren, Br., trials....xiv 208
Sirene, Fr.. trials....xiii 1094
Sir Henry Bessemer, mer. str., launch and des....viii 649
Sirius, Br., performance data, iii 597; coal consumption....vii 363
Siroco, Fr., data, xiii 782; trials....xiii 1093, 1095
Sir William Fairburn, mer. str., launch, viii 864; des....x 603
Sir William Siemans, mer. str., launch and des....viii 649
Sissoi Veliki, Rus., des. and trials....ix 184
Sithonia, mer. str., boilers....xiv 702
Six-inch gun test....xi 1074
Size and cost of warships, effect of accessories....xv 350
Size and speed of warships, increase in....xi 910
Size limits of steel plates, Homestead Works....i 135
Skagul, mer. str., trials....vi 590
Skat, Rus., data....xi 532
Skate, Br., repairs....viii 620
Skeandhu, yacht, data of quadruple-expansion engines....i 77
Skipjack, Br., changes in, ii 234; trials....ii 236, xii 246
Skjold, Denmark, launch....viii 612
Slaney, Br., des....i 266
Slide valve: inertia stresses of, vi 272; locomotive, friction of, xi 478; relief rings....xiii 849
Slieve Bearnagh, mer. str., des....vi 641
Slip joints....xi 898, 899
Slip of propellers, discussion, *Cushing*....iv 24
Slow combustion of iron, probable case....i 364
Small-tube boilers for large vessels....xiv 245
Small vessels, motive power of....v 882

Smelting, smoke of, discussed.....iv 170
Smith, David, Rear Admiral, U. S. N., retired.—Obituary.....xv 919
Smith, J. A. B., P. A. Engr., U. S. N.—The fitting up of a solid crank shaft.....iii 328
Smith, Admiral Sir N. Bowden, R. N.—Discussion, torpedo boat destroyers.....xiv 406
Smith, William Scharf, Chief Engr., U. S. N.—Obituary.....ix 217
Smith, W. Strother, Lt. Comdr., U. S. N.—Discussion, trial trips and the lessons to be learned from them, iii 176; the contract trials of the U. S. gunboats *Helena* and *Wilmington*, ix 360; contract trial of the U. S. S. *Nashville*, ix 574; method of measuring the sag and lining up shafting, ix 726; propeller-blade inaccuracies.....xvi 911
Smith, W. Stuart, Asst. Engr., U. S. N.—Boiler shop and plant at the Union Iron Works, California.....ii 139
Smoke:—Metcalf, iv 268; deposition, electrical, xiii 217; loss of heat, iv 802; nuisance in Paris, xi 770; observations in boiler trials, xii 49; oil fuel, xvi 866; pipes, lofty, iii 453; pipes, high, for *Brooklyn*, v 175, vi 669; pipes, standing and telescopic, i 220; prevention.—Booth, x 1064; prevention and boiler rating, xi 983; prevention, Orvis system, iii 295; volume and density in boiler testing.....x 135
Smokeless coal.....xi 1078
Smolensk, Rus., launch and des.....xiii 513
"Smooth-on" iron cements.....xiii 207
Snapper, Br., machinery.....viii 844
Society of Naval Architects and Marine Engineers, annual meeting, 1898, x 1129; annual meeting, 1899.....xi 1047
Soda ash, effect on boilers.....xii 441
Soft steel, brittleness produced by annealing.....x 965
Sokol, Rus., des. and trial.....vii 606, 833
Solace, data, x 534; steaming radius.....xiii 66
Soliani, Nabor, director of naval construction, Royal Italian Navy.—Transmission and distribution of power on modern ships, iv 173; water-tube boilers (translated by Worthington), vii 97; liquid fuel, vii 751; watertight doors, viii 327; reply to discussion, viii 344; compound marine boilers, viii 477; reply to discussion.....viii 513
Solid and hollow shafting, relations.....vii 507
Solid crank shaft, fitting up.....iii 528
Solid-drawn boiler tubes.....x 1102
Som, Rus., data, xi 533; trials.....xii 576
Some details in marine engineering.—Mudd.....iii 238
Some experiences with the U. S. torpedo boat *Goldsborough*.—Leopold..xv 778
Some experiments having reference to the durability of water-tube boilers.—Yarrow.....xi 633
Some experiments on the combination of induced draft and hot air applied to marine boilers fitted with Serve tubes and retarders.—Ellis, v 828; discussion.—Fothergill, 839; Milton, 841; White, 841; Terry, 842; Bevis, 843; Gross, 843; reply.—Ellis.....845

Some lessons from Samoa.—McKean, i 209; discussion.—Cowles, 215; Griffin, 218; Main, 212; Mattice, 220; Theiss, 218; Towne..... 215
Some new alloys considered in their chemical and physical aspect.—Webster..... ..iii 489
Some notes on marine-shafting forgings.—Willits.....xiv 226
Some problems in propulsion.—Weaver.....i 59
Some recent merchant steamers.....i 166
Somers, data, x 534; trials, xii 239; full data.....xiii 1082
South Dakota, characteristics, xii 810; launch.....xvi 995
Southery, auxiliary navy, x 538; data.....x 824
Southwark, mer. str., v 757; des., vi 218; boilers, Ellis and Eaves draft vi 748
Sovereign, see *Scorpion*.
Sovereign, yacht, des., viii 659, 873, x 611; race with steamer *Monmouth*, viii 873
Space occupied by air pumps, crank, fly-wheel, and direct-driven.....vi 549
Space occupied by machinery, naval and merchant vessels..... xiii 867
Space occupied by machinery of new cruisers.—Jordan.....i 249
Space, water-tube boilers vs. cylindrical.....xiv 411, xv 943
Spangler, Prof. W. H., formerly Asst. Engineer, U. S. N.—Discussion, trials of commandant's barge, Navy Yard, New York, i 37; engineering building for the University of Pennsylvania.....xv 578
Spanish Navy: battleships and cruisers, 1896, viii 853; cruiser, new, *Infanta Maria Teresa*, v 960; naval vessels, 1889, i 360; des. and assignment of vessels, iv 125; Niclausse boiler installations, xv 1172; ships destroyed, lessons from.....x 1128
Spanker, Br., changes in, ii 234; trial, ii 582; defects in 1892 maneuvers, iv 838; new boilers, vii 821; trials.....viii 392, 835
Sparrowhawk, Br., launch, vii 820, trials, viii 842; correction of data, ix 173; loss of.....xvi 1327
Spartan, Br., des. and trials.....iv 300
Spartiate, Br., des., viii 827; trials, xii 1103, xiii 274, xiv 965; note, xiii 283; boiler results.....xvi 527
Special nickel-chromium and silicon-steels.—Abraham.....xi 144
Special steels for ship and boiler construction.....x 203
Specifications: Cooper, v 559; boilers, 1888–1898 compared, xi 3; oil, U. S. Navy.....xi 469
Speed: and coal-consumption curves.—Mahony, xv 366; and power, relative, of English battleships, vi 493; and power trials of a light-draught steam launch.—Ward, x 183; and revolution curves, *Tacoma*, xvi 20; and wave form of vessels, effect on of form of bow, i 98; classified, British naval vessels, v 190; comparisons between large and small vessels, xi 921; curves: *Cincinnati*, *Raleigh*, *Maine*, *Monterey*, *Texas*, *Monadnock*, table of hull data used, iii 556; methods of plotting for progressive trials, iv 587; of ships building for the U. S. Navy, iii 555; economical, effect of auxiliaries on, v 474; economical, limits of in ships, xiii 661; economical, of new cruisers, iv 654; effect of depth of water on, iv 281; influence of foul bottom on, *Medusa* class, Br., ii 420;

of construction, a vital factor of naval strength.—King, x 150; discussion, Jones, 160; Theiss, 160; McFarland, 161; of ships, effects of shoal water on, iv 329; of small motors, measuring, xi 459; of vessels, accurate measurement of, ii 93; possibilities on the Atlantic, v 710; -problem, the.—Normand, ix 29; sustained sea, of new cruisers, iv 644; test of a wood and iron pulley, xii 1041; trials:—Taylor, iv 587; register for, iii 86; of fast ships.—Norton-McFarland, ii 68; discussion, Emory, 77; Weaver, 79; Mattice, 81; Warburton, 84; Eckart, 86; Dickie, 87; Forsyth, 89; Baird, 89; Denny, 333; McFarland, reply to discussion, 91; of the *Teutonic* and *City of New York*, ii 431; of the *Variag*, xii 1009; progressive, measured-mile, or standardized screw vs. measured course with turns, iv 604; warships, increase in.....xi 910
Speedwell, Br., changes in, ii 234; trials.....xiii 274
Speedy, Br., speed of, iv 302; launch and des., v 684; des. and trials, vi 199, vii 416; trial, v 1060, vi 350, 427; boilers, compared with *Satellit*, Aus., vi 394; boiler weights, vii 346, 363; Thornycroft feed-regulator, vii 491
Speedy, yacht, dimensions, viii 434; des.....viii 875
Sperry, Erwin S.—Influence of bismuth on brass and its relation to fire-cracks.....x 1069
Spetzia, Greece, trials.....iv 320
Spey, Br., des.....i 267
Spezia, model tank, experiments on propellers.....xv 1090
Spider, Br., trials, i 179; des.....i 265, 171
Spiral springs, experiments on.....xiv 255
Spirally-welded tubes.—Aldrich.....i 207
Spiteful, Br., trials, xii 245; oil-fuel trials.....xvi 1328
Spitfire, Br., speed, viii 843; machinery, ix 168; full-power trials.....ix 690
Spokane, mer. str., data, xiv 373; trials.....xiv 999
Spontaneous combustion of coal, xii 1073; notes on, Pacific-coast coals...i 72
Spontaneous ignition of coal, extracts.—Lewes.....iii 577
Spraying burners, oil.....xvi 849
Spree, mer. str., des., ii 589; dimensions and data.....iv 102, vi 162, x 283
Sprightly, Br., speed, xiii 776; trials.....xiv 208
Springs, spiral, experiments on.....xiv 255
Squadron, quick mobilization of.....xii 802
"Squatting" of vessels under way, causes, iv 329; discussion, i 33, 98; during steam trials, Comds. barge, Navy Yard, N. Y.....i 13
Stability: experiments, *Condor*, It., xii 78; metacentric height, of battleships, vi 466; of the *New Orleans* and the *Albany*, xi 1045; of vessels.....ix 740
Stag, Br., trials.....xiii 271
Standard: bolts U. S., strength of, xiii 338; international, for metric screw threads, xi 206; steam-cutter machinery for the U. S. Navy.—Maschmeyer, xiv 37; tables for electric wiremen.—Davis, book received, v 1097; trial conditions.....iv 598
Standardization of extra heavy pipe flanges.....xiv 274

Standardization trials, see Standardized Screw Trials and Progressive Trials.
Standardized screw, method for speed trials, advantages of.....v 206
Standardized screw, method of trials.....vii 41
Standardized screw trials: xvi 32; *Bancroft*, v 204, 377; *Decatur*, xiv 71; *Marietta*, ix 652; method of plotting curves, iv 587; *Rodgers*, ix 684; *Shubrick* and *Thornton*, xiii 602; *Vicksburg* and *Newport*, ix 557; *Wheeling*, ix 651; vs. measured course, with turn.....iv 604
Standart, Rus., des., vii 434; speed, ix 189; data.....ix 436
Standart, yacht, des.....x 287
Stanton, S. W.—American steam vessels.....vii 633
Star, Br., launch, viii 841; trials, ix 418; preliminary trial.....x 230
Starfish, Br., trials.....vii 818
Star of Australia, mer. str., launch.....xi 808
Statendam, mer. str., data.....x 1212
Station bill: general, for engineer's division, xvi 1220; *Illinois*, analysis of.....xiii 582
Station, quarter and watch bills, engineer division.....xiii 930
Stations in engineer division, xvi 1182; at drills.....xvi 1185
Status of boards on changes, as usually constituted under the contracts for construction of our New Navy.—Varney.....x 374
Staybolts, breakage of.....xii 520
Staybolt taps, extra long, hardening.....xiv 596
Stays for cylindrical boilers, formulae for strength of.....viii 269
Stead, John Edward.—Brittleness produced in soft steel by annealing, x 965; influence of copper on steel rails and plates.....xiii 678
Steam, book received.....x 1229
Steam: and electric drive for auxiliaries, compared, xvi 110; and water, temperature-entropy diagrams for, viii 285; auxiliaries, disadvantages of, xi 412; boiler trials, code of 1899, xii 37; compression of, in clearance space, x 641; condensation of, x 200; consumption, influence on of compression in cylinder clearance, xii 315; consumption in various types of engines, x 208; consumption of auxiliary engines in warships, Br., xi 388; consumption of the main and auxiliary machinery of the U. S. S. *Minneapolis*.—White, x 1; discussion, McFarland, 57; Wheeler, 59; Ward, 65; Meier, 66; Theiss, 66; Durand, 67; Aldrich, 69; Mallory, 72; Baird, 73; Worthington, 78; consumption, tests, turbines and reciprocating engines, xvi 1279; cutter for the Geman Navy.—Maschmeyer, translation, xiii 423; cutter machinery, standard for U. S. Navy, xiv 37; dryness of, vii 297; engineering plant, Navy Yard, N. Y., xiii 872; engine construction, 1807 to 1850, x 949, xi 373; engine efficiency, terms of, x 517; engines and Diesel motors, thermal efficiency, xi 396; engines, heat losses, xi 949; engines, thermal efficiency of, xi 949; engines, vertical, inverted, stresses on frames, xv 19; escape through orifices, experiments, xiii 1066; flow of through pipes, experiments on, xi 193; for transmitting power on shipboard, iv 176; -gas, thermodynamic action of, xi 760; -hammer, vs. hydraulic press, v 715; -heated surfaces, protection of, x 708; -jacket efficiency, maximum, iii

422; jackets, efficiency, triple-expansion engines, iv 486; jackets, circulation, iv 780; joints, Portland cement for, v 194; launch, first naval, ix 133; launch, light-draught, speed and power trials of, x 183; launches, see Launches; methods of determinining moisture in, vii 297; motors for small vessels, v 882; navigation, progress in, xi 904; navigation, 1807 to 1850, x 949, xi 373; Navy of the United States.—Bennett, book received, ix 213; outflow, experiments on, xvi 564; percentage required by auxiliaries, xvi 104; pipes: *Concord*, bursting of, iii 399; coverings, tests, x 708; explosions, German naval vessels, experiments to determine causes, vii 737; explosion on the *Aréthuse*, vi 785; failure of on S. S. *Ragusa*, v 361; explosion of on S. S. *Rohilla*, v 362; brazed copper, x 510; copper, bursting of, *Elbe* and *Lahn*, iii 410; expansion of, xi 897; list of inquiries on accidents, vii 535; remarks on.—Milton, vii 522; ruptures of, vii 65; ruptures of stop valve in *St. Paul*, viii 155; steel, welded, vi 731; their material, workmanship and arrangement.—Brett, v 347; water hammer in, v 362; water rams in, iii 407; wound, copper, tests of, vii 510; plant of the S. S. *Iroquois*, review and experimental test of, vi 445; power, iv 778; ports, width of, formula for, xvi 588; pressure and vacuum, calibrated for continuous record of marine engines, ix 6; quality of in boiler trials, xii 46; separators, efficiency of, iii 591; superheated, xi 486, 1073; superheated, advantages of, xvi 328; superheating and the Serpollet boiler, iii 588; superheated, experiences and results, xiv 539; superheating, notes on, viii 346; temperatures, measurements of, viii 115; transmission in factories and mills, xii 403; trials of the H. M. S. *Amphitrite*, xi 377; trials, progressive, xvi 306; turbines: Curtis, ix 785; Jansen, xvi 172; compound, application to marine propulsion, ix 374; C. A. Parsons on, xiv 1216; literature, xvi 945; propulsion for marine purposes.—Rateau, xvi 647; with special reference to the Westinghouse-Parsons steam turbine.—Hodgkinson, xiii 112; in England, x 1110; reversing, x 522; the steam engine of maximum simplicity and highest thermal efficiency, xiii 166; see Turbines, Steam; velocities of outflow, xvi 564; vs. hot water for heating, xii 430; yachts: American, x 393; as a naval auxiliary.—Stephens, x 1139; race, 1894, vi 438; *Wacouta*.—Fairburn, xiv 1151; *Yosemite*.—Isherwood.....vii 668

Steamboats: early.—Baird, xi 158; equipment of warships, launches, etc., xiii 1042; inspection service, proposed revision of rules, iv 210; inspection service, U. S., revision of the boiler laws.....xv 382

Steamers: light-draught, iv 836, x 509; modern, longevity of, v 1029; new, for Fall River line, des., iv 848; ocean, comparison of typical, vi 162; screw, causes of vibrations of, iii 12; towing, for Yukon service, x 740; trial data of, vi 590; vibration of, xiii 428; whale-back.....iv 453

Steaming radius: of U. S. naval vessels.—Bryan, xiii 50; *Truxtun*, *Whipple*, *Worden*.....xv 399

Steamships: companies of the world, large, iv 801; construction, graphic record of progress in, xiv 570; fast, ocean, v 808; see Merchant Steamers.

Steel: alloys, improving, xvi 327; aluminum, iii 501; and iron boiler tubes, manufacture and inspection, ii 301; and iron, effect of tempera-

ture on, ii 144; and iron exports, xii 500; and iron, Swedish, strength tests, x 1149; balls, strength of, xii 174; basic, experiments with, iv 432; basic, refined, on the continent, x 685; basic, Bessemer, iv 112; use not allowed, v 196; bending tests, iv 764; Bessemer basic, experiments with, effect of riveting, iv 448; boilers, joints and butt straps, formulae for, iv 403; boiler tubes, reasons for rapid corrosion of, vii 413; boiler tubes, seamless, limited endurance, xv 417; boiler tubes, to replace copper in British destroyers, vii 424; boiler tubes, tests for, ix 127; boiler tubes, nickel and mild, xi 633; bolts, safe load, xiii 341; boom in, xi 756; castings:—Hollis, i 193; Strickland, v 39; Willits, xv 122; cost of, i 185, iv 89; defects and their causes, xv 138; loss in finishing, i 204; *Maine* (old) and cruiser *No. 11*, failures of, iv 83; manufacture in the United States, xi 225; manufacture, tests and defects, xv 618; open-hearth, the manufacture of, i 185; shrinkage allowance.—Thurlow, v 43; tensile tests and analyses, i 206; tests and analyses, i 191; Tropenas process, x 701; chrome, iii 503; copper, iii 504; correct treatment of, xiv 138; crank-shaft forgings.—Hunt, iii 1; faults and defects, and their causes, xiv 178; forgings.—Porter, ix 101; bored and fluid-compressed methods compared, x 1016; cost of, i 205; crank shaft, iii 1; hollow, ix 84; manufacture, tests and defects, xv 615; foundry, Westinghouse, 1900, xii 227; hints on inspection of, xv 609; hot-bath tempering, xiv 273; increase in strength of, after manufacture, xi 199; influence of casting temperature, xi 730; ingot making, xiv 276; liquid compression, xiv 275; machine, case hardening, xiv 590; manganese, iii 505, v 483; manufacture in India, xi 1005; nickel, iii 506; for crank pins and axles, x 474; physical properties, xi 150; properties and possible uses, xii 108; open hearth, basic, experiments with, effect of riveting, iv 448; improvement in, xi 449; paints and painting, xv 628; peculiarities, xiii 1071; plant, new, Carnegie, xi 1075; plates: flanging heat for, xi 765; limits of sizes at Homestead Works, i 135; manufacture, tests and defects, xv 610; notes on inspection and manufacture.—Hunt, i 128; tests, boiler, construction, v 892; process, Talbot, Pencoyd Iron Works, xii 152; production in U. S., xi 739; rails and plates, influence of copper on, xiii 678; semi, x 772; shafting, hollow, ix 84; ships, twenty-five, xi 1117; silicon, iii 507; soft, brittleness produced by annealing, x 965; special chromium, nickel and silicon, xi 144; special for ship and boiler construction, x 203; steam pipes: remarks on, vii 522; welded.—Hill, vi 731; structural, manufacture, tests and defects, xv 621; surface hardening, Harvey process, iii 590; structures, permanence of, xiii 210; tensile strength, effect of temperature on, i 134; tests under repeated stresses, xiv 1223; tubes, solid-drawn, manufacture of, ix 773; Tungsten, iii 508; and Molybdenum, xii 228; Vanadium, xiv 272; vs. iron boiler tubes, iv 488; vs. iron tubes, v 1030; works in Japan, x 1162; world's production, xiii 178; zinc as a protective coating for..... .....xii 789

Steering apparatus, electric for ships.....viii 576

Steering gear, pneumatic, *Terror*.....ix 23

Sterling, data, x 534; steaming radius.....xiii 66

Stern-tube and bracket bearings, method of boring out, *Cincinnati*.....v 1
Stern tubes: and struts, supports for boring bars for.—Roelker, v 340; boring out and alignment of shafting, Union Iron Works.....v 7
Stern wheel: gunboat for the upper Chindwin, iv 836; river gunboats, French, iv 523; steamer for Argentine Government, des.....v 248
Stertiade, Rus., speed.....xiii 793
Stettin: floating dock, x 283; graving dock.....x 677
Stevenson, H. N., Chief Engr., U. S. N.—Discussion, tubulous boilers, ii 197; the contract trials of the U. S. gunboats *Vicksburg* and *Newport*, ix 549
Stewart, destroyer *No. 13*, named, x 818; full data, xiii 1082; trials xiv 1237; des. and contract trial.....xv 111
Stickney, Herman O., Asst. Engr., U. S. N.—Discussion, experimental station and engineer school.....vii 466
Stillwell feed heaters.....iv 399
Stirling Castle, mer. str., data.....vi 162
Stockton, torpedo boat *No. 32*, named, x 818; trials, xiii 256; full data, xiii 1082
Stokers: automatic, for marine use, xi 67; automatic and mechanical, aids in boiler testing, x 133; mechanical, xii 466; Crowe, xii 901; *Pennsylvania*, mer. str., xi 561; Rony, power plant, Navy Yard, N. Y., xiii 985
Stoking indicators for timing firing of furnaces.....xvi 1291
Stop valves, automatic safety, *Texas*.....viii 592
Storage batteries: xi 733; Edison, xiii 669, 1075; Edison's work in, xiii 456; *Adder* and *Mocassin*, xv 53; for torpedo boats, x 958; for torpedo-boat propulsion.....xi 55
Stores for repair ships.....xiv 1070
Strains, temperature and launching, *Hopkins* and *Hull*.....xv 712
Stranger, data.....x 824
Straps, butt, for boilers, formulae, for.....iv 403
Stremitelni, Rus., speed.....xiv 1265
Strength: of boilers, xi 748; of destroyers, xiv 396; of high-speed vessels, xiv 1186; of material, increase during ten years, xiii 833; of rubber hose, xii 154; of seams, stays and braces for cylindrical boilers, formulae for, viii 269; of shell and flanged plates proposed for steamboat inspection service, iv 216; of steel balls, xii 174; of torpedo boats, v 483; tests of Swedish iron and steel, x 1149; of U. S. standard bolts.—Williams.....xiii 338
Stresses: inertia of a slide valve, vi 272; inertia, of elastic gears, xii 329, 603, 913; in crank shafts, viii 665, ix 42, 318, 482; of engine parts, cargo steamers vs. torpedo boats, xiii 853; on frames of vertical inverted steam engines, xv 19; on frames of vertical steam engines.....xv 971
Strickland, Geo. D., P. A. Engr., U. S. N.—Steel castings.....v 39
Stringham, torpedo boat *No. 19*, data, x 818; launch, xi 781; accident on trial, xi 902; engine accident, xiii 260; boiler accident, xiii 770; full data.....xiii 1082
Stromeyer, C. E., Engineer-Surveyor, Lloyd's Register.—Temperature effects on iron and steel, ii 145; discussion, transmission of heat

through tube plates, v 460; marine boiler construction, v 890; measurement of feed and circulating water, etc., by chemical means.....viii 517
Strombus, mer. str., des., xii 266; correction of data.....xii 577
Structures and machines, similar.....xi 976
Structural steel, manufacture, tests and defects.....xv 621
Struts and stern tubes, supports for boring bars for.....v 340
Study of alloys suitable for bearing purposes.—Clamer.....xvi 964
Study of the element of a screw propeller.—Durand.....iv 73
Study of the energy of the bow wave.—Niles.....xi 591
Sturgeon, Br., data., vii 425; speed, vii 602; steel replace copper boiler tubes.....vii 822
Sturgeon class, Br., machinery data.....viii 568
Submarines: future of, xiv 1207; development in the direction of increased scope, xv 1211; in various navies, xvi 669; progress, 1903, xvi 666; requirements, xiv 304; signaling, xiii 212; the, xiii 1056; new Goubet, 1896, viii 158; opinion of the.—M. Lockroy, xiv 608; explorer, Kroehl's, xiv 852; destroyers, xiii 731; torpedo boats.—Baird, xiv 845; British, des., xiii 492; launch, xiii 1113; *No. 2*, tests, xiv 966; *No. 5*, launch, xiv 966; new, launch, xvi 691; *A1*, foundering of, xvi 691; refloating of, xvi 1008; new, Br., xvi 1328; and submersibles, Fr., xvi 355; France (six), 1899, xi 254, xvi 667; performances of, xiii 730; note on, xiv 1231; names, xiii 293; *Escopette*, data, xi 800; *Espadon*, launch, xiii 1095; *Flamberge*, data, xii 800; Goubet, data, xi 254; *Gustave Zédé*, note, xiii 289; accumulator accident, vi 619; *Ludion*, data, xiii 781; *Lynx*, data, xiii 781; *Morse*, data, xii 568, xiii 291; *Naiade*, data, xiii 781; *Narval*, data, xiii 291; *Pertuisane*, data, xi 800; *Protée*, data, xiii 781; *Rapiere*, data, xi 800; *Silure*, submerged 140 feet, xiv 609; mishap, xiv 968; *Sirene*, trials, xiii 1094; *Sirene*, *Triton*, *Espadon*, *Silure*, data, xiv 330; *Triton*, data, xiii 1094; boiler accident, xiv 968; Germany, xiv 578; *Holland*, test, xi 1089; purchase, xii 556; *Nos. 3-8*, gasoline engines for, xiii 144; trials, xiii 243; *Delfino*, It., trials, xiii 1117; Norway, xiii 509; U. S., contracts for six placed, xii 1096; *Adder*, name, xii 825; data, xiii 475; launch, xiii 767; contract trials, xv 39; *Fulton*, launch, xiii 767; test, xiv 298; gasoline explosion, xiv 614; *Grampus*, name, xii 825; contract and standardization trial, xv 584; launch, xiv 947; *Moccasin*, name, xii 825; data, xiii 476; launch, xiii 767; contract trials, xv 39; *Pike*, name, xii 825; contract and standardization trial, xv 584; *Plunger*, launch, ix 794; the.—Scott, x 366; launch and des., x 366; contract trials, xv 859; *Porpoise*, name, xii 825; data, xiii 476; launch, xiii 1085; contract trials, xv 859; *Protector*, des., xv 1211; War Department report, xvi 1304; *Shark*, name, xii 825; data, xiii 476; contract trials.....xv 859
Subscribers, lists, see List of Members of the Society.
Substitute for celluloid.....xii 517
Success, Br., speed.....xiv 658
Success of ferruled boiler tubes in the British Navy.....iv 837
Suchet, Fr., trials, vi 428; speed and dimensions, x 576; boiler trials, xvi 458
Suction draft for boilers.—Gross.....vi 744
Suction pipes, air chambers on.....x 1119

Suez, mer. str., data of quadruple-expansion engines.....i 81
Suez canal: petroleum regulations, iv 107; traffic in.....v 716
Suffolk, Br., trials.....xvi 258
Suffren, Fr., data, x 874; Niclausse boilers, x 1202; launch, xi 800; data, xi 1106, xiv 332; des., xiv 968; trials xvi 352; success of Niclausse boilers.....xvi 699
Sugar-cane residium (bagasse) as fuel for boiler testing.....x 142
Sully, Fr., boiler trials.....xvi 460
Sulphur: effect in cupola practice, x 1047; effect on malleable cast iron, xi 168; elimination from iron.....iv 757
Sultan, Br., refitting.....vii 600
Sultan, Egypt, des.....ix 798
Suma, Jap., data.....xiv 357
Sumatra, mer. str., launch and des., vii 626; des.....vii 850
Summers, Bertrand S.—Modern cupola practice.....x 1045
Sunderland; Br., des. and trials.....ii 244
Sunfish, Br., speed, vii 822; trial.....viii 181
Superheated steam: xi 486, 1073; advantages of, xvi 328; errors in measuring tempertures, viii 130; experiences and results, xiv 539; practical use of.....iii 588
Superheaters: value of, i 152, xiv 280; receiver, efficiency of, xii 749; steam, various types and notes on.....viii 346, 351
Superheating: steam and the Serpollet boiler, iii 588; economy by, x 205; notes on.....viii 346
Superior City, mer. str., des.....x 607
Supply, auxiliary navy, x 537; data.....x 824
Supports for boring bars for stern tubes and struts.—Roelker.....v 340
Surcouf, Fr., speed, iii 601; performance data.....v 504
Surly, Br., trials, vii 423; machinery and trials, viii 175; oil fuel, x 863, xiv 1229
Surprise, Fr., note, vi 205; trials.....viii 405
Surface hardening steel, Harvey process.....iii 590
Surface of screw propellers, arrangement of.....v 300
Survey and registry of shipping.....v 661
Survey of measured mile, Newport, R. I.....iv 608
Sustained sea speed of cruisers.....iv 644
Sutlej, Br., trials.....xiii 490, 776, xiv 206
Suwanee, data.....x 534
Svea, Swed., reconstruction.....xiv 692
Sviellana, Rus., named, viii 200; launch and des., ix 187; des...vii 607, x 269
Swedish: iron and steel, strength tests, x 1149; navy, water-tube boilers, xii 748; Yarrow boilers in, xv 838; torpedo, new.....xiii 465
Swiftsure, Br., ex *Constitucion*, Chili, trials.....xvi 682
Swinton.—Discussion, compound marine steam turbines.....ix 382
Swordfish, Br., des. and trial, viii 618; trials, viii 843; machinery, ix 168; full-power trials.....ix 691
Sybille, Br., work on, ii 421; trials, iv 304; machinery test, v 519; wreck, xiii 491
Sylph, data.....x 824

Sylvia, data.....x 824
Sylvia, Br., speed.....x 860
Sylvania, mer. str., des., vii 191, 443; trial and des.....vii 843
Synchronous motors for electric-power transmission.....xii 415, xiv 821
Synchronous torsional vibrations of shafting.....xiv 721
Syren, Br., trial.....xiii 1112, xiv 322
System of electric driving in shops.....xii 162
System of induced draft, Martin's.....ii 567
Systems and efficiency of electric transmission in factories and mills.—Aldrich.....xii 402
Szigetvar, Aus., data.....xiii 1090

T

Tt, Fr., data.....ix 178
Table showing the loss of pressure in steam pipes.....xii 207
Tabor indicators compared with Thompson and Crosby.....v 1025
Tacoma, data, xi 508; data, xi 1081; general description, official trial, xvi 1; tactical considerations involved in torpedo-boat design.....xi 1060
Tage, Fr., des., iii 462; defects in.....iv 313
Tail-shaft preserver.....v 712
Takasago, Jap., data.....x 580, xiv 357
Talbot, torpedo boat *No. 15*, des. and trials, x 493; launch, x 533; full data, x 818; xiii 1082; steaming radius.....xiii 66
Talbot, Br., data, v 516; launch and des., vii 427; trials.....viii 616, xi 324
Talbot steel process at the Pencoyd Iron Works.....xii 152
Talcott, Charles Gratiot, Asst. Engr., U. S. N.—Obituary.....i 270
Tallapoosa, break-down of air-pump gear.....i 248
Tampico, Mex., launch and des.....xiv 1262
Tangential pressure curves from engine of *City of Paris*.....vi 320
Tanglin, mer. str., test of oil fuel.....xiv 609
Tanks: experimental, xv 967; for Russia.....v 194
Tantallon Castle, mer. str., des.....vii 193
Taper of pipe threads.....xi 231
Tapperheten, Swed., data.....xiv 691
Taps, stay bolt, extra long, hardening.....xiv 596
Tarantula, yacht, turbine installation, xvi 1095; new boilers.....xvi 1341
Tar coatings for iron water pipes.....xi 931
Tarpa, Chili.....xiv 618
Tartar, Br., des., i 266; trial data.....iv 426
Tartare, Fr., paddle steamer, trials.....iv 580
Tashmoo, mer. str., race.....xiii 795
Tasmanian tin, mines and export of.....xi 1073
Tatsuta, Japan, des.....vi 429
Taupo, mer. str., trials.....vi 590
Taylor, D. W., Naval Constructor, U. S. N.—The causes of the vibrations of screw steamers, iii 12; speed trials, iv 587; *Maine*, progressive trial, xvi 526; quoted on rotation of propellers.....xvi 123

Taylor-White, tool-steel process, of the Bethlehem Steel Co.....xii 806
Tchihatchoff, mer. str., electric lighting.....v 183
Teal, Br., des.....xiii 777
Teazer, Br., machinery.....viii 621
"Technic," University of Michigan, annual, 1888.....i 89
Technical education.....vii 508
Tecumseh, data.....x 534
Tees, Br., des.....i 267
Tegethoff, Aus., new machinery, des. and trial.....vi 421
Teinster, mer. str., note.....ix 201
Tejo, Port., launch.....xiv 359
Tekoa, mer. str., des. and trials.....iv 134
Telegraph: British Navy, v 180; wireless, tests in U. S. Navy.....xi 1034
Telegraphy: Marconi wireless, naval tests, xi 776; printing, xi 503; wireless, in the Navy, xiv 278; wireless, Slaby-Arco system, used by Germany.....xiv 932
Telena, mer. str., launch.....vii 853
Telephony, wireless.....xi 1077
Temeraire, Br., new boilers, iv 837; training of engine-room artificers, xvi 646
Temerario, Sp., trials.....iv 319
Temperature: casting, influence upon steel, xi 730; effect on metals and alloys, ii 144; effect of variation of, on strength of metals, iii 500; -entropy diagrams for steam and water.—Nulton, viii 285; -entropy, and entropy diagrams, x 329; of tubes in water-tube boilers, Yarrow experiments, viii 138; strains, *Hopkins* and *Hull*, xv 712; high, by new method, xi 772; observed in superheating systems, viii 364; of steam, measurements of.....viii 115
Tempered copper.....iii 497
Temperley conveyor.....xiii 17
Tempering steel, hot bath.....xiv 273
Tenare, Fr., data.....vii 148
Tenasserin, mer. str., data of quadruple-expansion engines.....i 79
Tenders to torpedo flotilla and the fleets, the use of repair ships as...xiv 1046
Teniente Serrano, Chili, launch, viii 611; trials.....ix 143
Tennessee, des. xiv 941; horsepower, xiv 1237; launch and des.....xvi 1311
Tennyson, D'Eyncourt E.—On the limits of economical speed of ships, xiii 661
Tensile strength: iron and steel, ii 148; of material, increase during ten years.....xiii 833
Tensile tests: and analyses, steel castings, i 206; at high temperatures, x 516; steel plates.....i 130
Terms of steam-engine efficiency.....x 517
Terpsichore, Br., des.....iii 596
Terrible, Br., note on, v 516; des., vi 197; launch and des., vii 584; comparison with new cruisers, viii 557; preliminary trials, viii 613; trials, viii 811, ix 153, x 562, 1180, xi 322, xiv 298; run, x 860; compared to *Jeanne d'Arc*, Fr., xi 797; runs compared with *Powerful*, Br., xii 737; data, compared with protected cruisers, xii 1015; overhaul of, xvi 690; voyage with Belleville boilers.....xvi 1293

Terror, authorization and data, i 236; and the pneumatic system as applied to the guns, turrets and rudder.—Kinkaid, ix 14; reconstructed monitor, ix 528; steaming radius, xiii 66; vs. *Amphitrite*, pneumatic and hydraulic systems compared.....ix 542
Terror, Sp., launch, viii 856; trials.....ix 189
Terry, S. H.—Discussion, induced draft and hot air, combined, in boilers fitted with "Serve" tubes and retarders.....v 842
Test of a Babcock & Wilcox boiler built for the *Alert*.....xi 285
Test of a Babcock & Wilcox boiler to determine its evaporative efficiency.....vii 694
Test of a condenser and evaporator, 1847.....xiii 343
Test of a Diesel motor.....xi 73
Test of a Niclausse boiler under forced draft.—Parks.....xvi 1060
Test of a No. 4, type B, horizontal evaporator.—Baird.....viii 95
Test of Corliss boilers, etc., etc.—Isherwood.....i 299
Test of one of the Babcock & Wilcox boilers of the *Cincinnati*.....xii 882
Test of the evaporating plant of the *Iris*.....xi 889
Test of the machinery of the Minnesota Steamship Co.'s steamer *Pennsylvania*.—Bryan-White.....xi 557
Test of Worthington pumping engines, New Bedford, Mass., Isherwood..ii 26
Test of wound-copper pipes.—Wachsmann.....vii 510
Testing: boilers with various fuels, x 129; of dynamos, British Navy, v 181; ships' models, apparatus for, viii 788; tanks for ships' models, Washington Navy Yard, xi 712; torpedo-boat destroyers, Br.....xiv 931
Test pieces: for boiler material, proposed for steamboat inspection service, iv 214; steel plates.....i 131
Tests: see also Experiments; air-lubricated journals, ix 267; alloys, ii 161; armor, xi 227; bearings, machinery, friction of, ix 104; Blake pumping engine, Newton, Mass., v 769; blowing fans, xii 157; blowers, fan, iii 482; boiler circulation, Yarrow, viii 133; boiler plates, steel, i 132; boiler tubes: ii 305; in German Navy, xi 492; loss of weight from corrosion, xii 596, 909, xiii 335, 823; nickel and mild steel, xi 635; steel, ix 127; boilers: Almy water-tube, evaporative, ix 135; Babcock & Wilcox, vii 704; Babcock & Wilcox, table of efficiencies, xiii 223; Belleville, ii 564; Belleville, yacht *Shearwater*, Br., ii 484; Belleville, Herreshoff, Towne, Ward, Scotch, locomotive, Thornycroft, ii 170; comparative, Ward and Cowles, ii 414; comparative, Ward and Thornycroft, ii 581; comparative, plain and ribbed tubes, iii 346; Corliss, i 299; D'Allest, vi 368; Du Temple-Guyot, ix 772; *Hermione*, Br., evaporative, vii 151; Hohenstein, with coal and oil, xv 225; hydraulic life boat *Queen*, oil fuel vs. coal, x 390; Lagrafel and Lagrafel-D'Allest, v 949; Niclausse, safety, water-tube, x 111, xi 881; Thornycroft, model, vii 730; Yarrow, vi 163; with various fuels, methods for best results, x 129; British gas engines, xi 1038; Brown's improved type furnace, xv 182; cast-iron flanged heads, x 662; cellulose, water-excluding properties of, iii 466; centrifugal fans, ix 293; centrifugal pump, xiii 719; *Clara*, yacht, determination of continuous record of engines, ix 6; coals: Alabama, comparative, i 122; Alabama, Pittsburg and Cumberland, comparative,

i 123; George's Creek, Cumberland, on board *Dolphin*, vii 329; Lehigh, anthracite, under Corliss boilers, i 299; coatings for cast-iron water pipes, xi 943; coke, efficiency of, *Dolphin*, vi 736; compression of steam in the clearance space, x 641; copper alloys, endurance of, in sea water, xi 349; corrosion of boiler-tube samples, xiv 518; cotton-mill engine, x 665; *Cushing*, coal consumption, iv 36; differing conditions of propellers, rudder, etc., iv 24; delta white, anti-friction metal, v 717; Diesel motor, x 179; distilling plant, "Lillie" multiple effect, at Dry Tortugas, xii 85; efficiency of jacketed single-cylinder engines, v 277; efficiency of jacketed triple-expansion engines, v 288; electric lamps, economy of, x 404; engineering subjects, British Navy, vii 779; evaporators: ii 505; horizontal, No. 4, type B, Baird, viii 95; *Petrel*, *Yorktown*, *Concord*, *Bennington*, *Charleston*, i 291; under various conditions, vii 494; feed pump, xiii 722; furnaces, Fox's corrugated, iv 262; various forms, v 38; gas jets, x 408; gasoline engines for Holland submarines, xiii 149; heat transmission through tube plates, v 436; ice machine, *Atlanta*, iv 775; indicator, iii 322; induced draft, Martin's system, vi 568; jib crane, electric, 150 tons, xi 182; *John W. Gates*, mer. str., coal-consumption, xii 895; joints, steel pipes and flanges, xiii 845; liquid fuel, xv 254; melting point of various cast irons and pig irons, x 1011; metals, Watertown Arsenal, xiii 189; *Meteor*, i 227; naval, of Marconi wireless telegraphy, xi 776; of a Du Temple-Guyot boiler, ix 772; of a modern Thornycroft boiler.—Capper, vii 730; of a Niclausse boiler at Cramp's, xi 881; of a refrigerating plant, xii 142; of boiler of Purdue locomotive.—Goss, xiii 70; of the boilers of the steam yacht *Wild Duck*.—Hollis, vii 79; of oil-fuel apparatus, successful, xiii 216; oil fuel, hydraulic life boat *Queen*, x 385; *Oregon* refrigerating plant, viii 465; Orvis system of increased vaporization and smoke prevention, iii 295; Parsons' condensing steam turbine, using superheated steam, v 900, 914; pipe and boiler coverings, x 708; propellers, yacht *Ethel*, v 302; pumping engines, Washington, D. C., i 41; pumps, crank and direct-acting, steam consumption, xiii 870; receiver superheater efficiency, xii 754; reheaters in multiple-cylinder engines, xii 385; relation of bismuth in brass to fire cracks, x 1069; retarders in Scotch boilers, viii 779; riveted joints: Watertown Arsenal, for Edward Kendall & Sons, viii 727; for the Bureau of Steam Engineering, Navy Department, iv 624; in thin plates, xii 1080; rivets, nickel-steel, x 1038; salt and alkali, of feed water, viii 537; Serve tubes, vi 785; steam consumption of main and auxiliary machinery of the U. S. S. *Minneapolis*, x 1; steam jacket efficiencies, iii 425; steam-pipe explosions in German naval vessels, vii 737; steam pipes, welded, vi 733; steam plant of S. S. *Iroquois*, vi 445; steam temperatures, measurements of, viii 115; speed of a wood and iron pulley, xii 1041; steel: and iron bars, ii 154; basic, iv 432; basic refined, x 689; bending and contraction of area as proofs of quality of, iv 764; boiler, shop, v 892; steel castings: and analyses, i 191; tensile and analyses, i 206; steel containing copper, xiii 686; steels, nickel-, chromium- and silicon-, xi 154; steel plates, tensile, i 130; steel under repeated stresses, xiv 1223; superheaters, various types, viii 351; Swedish

iron and steel, strength of, x 1149, tensile, at high temperatures, x 516; throttling calorimeters: vii 140; to determine reliability, viii 98; triple-expansion pumping engines, East London water works, vii 215; vibration, *Deutschland*, mer. str., xiii 428; wireless telegraph, U. S. Navy, xi 1034; Worthington pumping engines, ii 26; Worthington pumping engine, New Bedford, Mass., i 299, ii 299; wound copper pipes, vii 510; Yarrow boiler, vi 163; Yarrow's feed-water heater....x 412
Teutonic, mer. str., des., i 167, 361; record voyage, ii 431, iv 495, 793; dimensions and data....iv 102, 162
Teviot, Br., trials....xvi 259
Texan, mer. str., balance cylinders....xvi 905
Texas, des., i 177; authorization and data, i 236; work on, ii 412, iv 291; speed curves, iii 556; launch and des., iv 515; torpedo boats for, v 729, vi 526; dock trial, vi 421, 600; des. and contract trial, viii 82; automatic safety-stop valves, viii 592; steaming radius....xiii 66
Thacker coal, tests....xi 96
Thames, Br., des....i 170, 265
Thames, mer. str., des....vi 635
Theiss, Emil, Lt. Comdr., U. S. N.—Discussion, "Some Lessons from Samoa," i 218; correcting indicator cards for weight of reciprocating parts, i 283; Turkish torpedo boats, translation, ii 113; discussion, trial trips and the lessons to be learned from them, iii 178; translation, effect of forced draft (artificial) on boiler construction, iii 349; the contract trials of the U. S. S. *Monterey*, v 115; discussion, steam consumption of the *Minneapolis*, x 66; discussion, trials of the Niclausse safety water-tube boiler, x 123; discussion, speed of construction, a vital factor of naval strength, x 160; endurance of the ordinary copper alloys in sea water, translation, xi 336; notes on details of construction and arrangement of marine machinery....xiv 1
Thenard, Fr., contract for....viii 192
Theoretical and practical endurance of warships....iii 132
Theory, mathematical, of naval architecture, advance in, etc....ix 730
Theory of the centrifugal pump.—Leopold, part I, iii 335; part II....iii 483
Thermal efficiency: boilers, British report, xvi 922; of steam engines, xi 949; of steam engines and Diesel motors....xi 396
Thermit, aluminum-....xii 1029
Thermodynamic action of steam gas....xi 760
Thermodynamics, limitations of....xii 219
Thermometers: Bristol, viii 117; calibration of for steam temperature measurements, viii 116; Green's, viii 121; mercury baths or wells vs. oil....viii 115, 127
Theseus, Br., details, v 226; des., iii 134, v 1049, 1054; trial....vi 198
Thespia, see *Hist.*
Thespia, yacht, launch and des....vii 630
Thetis, Br., performance data....iii 597
Thetis, Ger., trials....xiv 333
Thin tube sheets for boilers advocated....v 330
Third-class cruisers, Fr....iii 600

Third-class torpedo boats for *Maine* and *Texas*.....v 729
Thirty-knot torpedo-boat destroyers, Br., dimensions, vii 820; five ordered, viii 186; six ordered, viii 401; eighteen ordered.....viii 622
Thirty-two-knot torpedo-boat destroyers, Br., two ordered.....viii 401
Thistle, Br., contract, ix 804; des., x 1187; trials.....xi 1106, xii 246
Thom, John.—On comparison of mechanical drafts, viii 140; discussion, water-tube boilers.....viii 509
Thompson, Chile, purchase.....xiv 618
Thompson indicators, compared with Tabor and Crosby.....v 1025
Thor, Swed., data.....ix 193
Thorn, Br., trial.....xiii 271
Thornton, torpedo boat *No. 33*, named, x 818; launch, xii 825; contract trials, xiii 580; full data, xiii 1082; trials.....xiv 304
Thornycroft automatic feed regulator.....vi 790, vii 421
Thornycroft boilers: v 945, vii 730; circulation shown by model, viii 494; comparative test with Ward, ii 581; compared with others, xiv 420; des., ii 176; diagram, ii 418; feed regulator, x 518; in navies, xvi 292; new, vi 156; ships fitted with, data, xiv 504; tests, ii 170; torpedo boat, xvi 154; water-tube, circulation in.....vi 349
Thornycroft boilers, in vessels: *Aegir*, *Iltis*, *Jaguar*, *Luchs*, *Niobe*, *Tiger*, Ger., xiv 117; *Arkansas*, *Daring* type, xiv 1182; weight compared with other monitors, xv 576; *Avon* and *Bittern*, Br., viii 568; *Bainbridge*, xiii 1082; *Bainbridge*, *Barry*, *Chauncey*, *Daring* type, xiv 1012; *Barry*, xiii 1082; *Barham* and *Bellona*, Br., viii 391; *Chauncey*, xiii 1082; *Cushing*, ii 580, iv 14, xiii 1082; *Dale*, xiii 1082; *Daring* type, building of, xii 25; *Davis*, xiii 1082; *Decatur*, *Daring* type, xiii 1082, xiv 64; destroyers, Br., *Boxer*, *Ardent*, *Bruiser*, *Decoy*, *Daring*, *Handy*, vii 797; *Ericsson*, xiii 1082; *Farragut*, xiii 1082; *Fox*, xiii 1082; *Hopkins*, xiii 1082; *Hopkins* and *Hull*, *Daring* type, xv 706; *Hull*, xiii 1082; *Geiser*, Den., tests, v 163; *Goldsborough*, xiii 1082; *Mackensie*, xiii 1082; *McKee*, xiii 1082; *Missouri*, xv 1200; *Ohio*, xvi 1050; *Oneonta*, yacht, x 399; *Paul Jones*, xiii 1082, xiv 786; *Pelorus*, Br., viii 568; *Perry*, xiii 1082, xiv 786; *Preble*, xiii 1082, xiv 786; *Queen*, hydraulic life boat, fitted for oil fuel, x 389; *Shubrick*, xiii 596, 1082; *Stockton*, xiii 1082; *Stringham*, xiii 1082; *Thornton*, xiii 596, 1082; *Tingey*, xiii 1082, xvi 58; *Truxtun*, *Whipple*, *Worden*, *Speedy* type, xiii 1082, xiv 1090, xv 396
Thornycroft screw-turbine propeller.....v 479
Thornycroft, Sir John I.—Discussion, experiments on the arrangement of the surface of a screw propeller, v 319; circulation in the Thornycroft water-tube boiler, vi 349; discussion, cylindrical vs. water-tube boilers, vi 392; on British naval machinery, vii 363; torpedo-boat destroyers, vii 711; discussion, water-tube boilers, viii 508; on German warships, viii 556; discussion, compound marine steam turbines, ix 381; discussion, effect of direction of turning of twin screws, x 492; discussion, water-tube boilers a necessity, xi 22; discussion, conversions and rearmament of ships, xiii 629; discussion, torpedo-boat destroyers, xiv 406
Thornycroft torpedo-boat trials.....vi 590

Thrasher, Br., data, vii 820; launch, viii 181; trials, ix 172; grounding, ix 807, x 232
Three Saints, Tri Sviatitelia, Rus., launch and des.....vi 211
Three-stage compressor, 150 horsepower.....xii 1037
Throttling calorimeters: tests, vii 140; the reliability of.....viii 98
Thrust bearings, oiling arrangements.....ix 122
Thule, Swed., launch and des., v 521; reconstruction.....xiv 692
Thunderer, Br., boilers, defects in, iv 280; ferruled boiler tubes, iv 837; trial, v 453; gun accident.....xiii 283
Thurston, Prof. R. H.—Maximum steam jacket efficiencies, iii 422; reheaters in multiple-cylinder engines.....xii 385
Tide, effect of, on progressive speed trials.....iv 589
Tide, yacht, des.....x 402
Tiger, Br., trial.....xiii 271
Tiger, Ger., launch, xi 1110; coal-consumption and boiler data, Thornycroft.....xiv 117
Timbira, Brazil, note.....ix 406
Time and coal-consumption for the voyage of the *Oregon*.....xii 432
Timing indicators for firing of furnaces.....xvi 1291
Tin, Tasmanian mines and export.....xi 1073
Tingey, torpedo boat *No. 34*, named, x 818; launch, xiii 474; full data, xiii 1082; general description, contract trial.....xvi 50
Tintagel Castle, mer. str., des.....ix 204
Tiradentes, Brazil, launch and des.....iv 527
Titania, see *Marcellus*.
Tobin bronze.....iii 494, xv 205
Tokiwa, Jap., data, x 580; launch and data.....x 892
Tonawanda, see *Amphitrite*.
Tonnage of vessels of the Great Lakes.....v 154
Tonquin coal.....iii 125
Tools: electrical operation of, xiv 581; machine, power losses, xii 124; pneumatic, in the Navy.....xiv 930
Tool steel, Taylor-White process.....xii 806
Topaze, Br., comparison with *Hamburg*, Ger., xvi 360; laid down, xvi 688; reciprocating engines, compared with *Amethyst*, turbines.....xvi 1242
Topeka, data, x 534; steaming radius.....xiii 66
Torch, Br., des., v 518, vi 203; trials, vii 601; coal consumption.....viii 172
Tordenskjold, Nor., launch and des.....ix 432
Torpedo-boat destroyers, see also Destroyers.
Thornycroft-Barnaby, vii 711; Barnaby, xiv 396; discussion, xiv 396; Yarrow, 404; Thornycroft, 406; Smith, 406; Elgar, 406; Hamilton, 407; Freemantle, 407; Morant, 408; Henderson, 408; Argentine, ordered from Yarrow, viii 161; as scouts, xvi 670; British, vii 796; British trials.....xiv 46
Torpedo boat *Cushing* and its experiments investigated.—Isherwood.....iv 1
Torpedo boat Flotilla, repair ship as tender for.....xiv 1046
Torpedo Flotilla: Br., 1893, v 517; Austrian.....xvi 997
Torpedo-boat station at Norfolk, Va.....xiv 277

Torpedo Boats.
Adler, Aus., boiler explosion, xii 197; *Alarm*, Br., des. and trial, vi 200; aluminum, des. and trials, vi 786; and locomotives, comparison with oil fuel, xvi 823; *Antelope*, Br., des. and trial, vi 200; *Aquila*, It., accident to, vii 605; *Aquilon*, Fr., des., viii 191; trials, viii 405; *Argonaute*, Fr., trials, vi 619; arguments against, iv 2; *Ariel*, Fr., comparative data, ix 35; *Assaye*, Br., launch, iii 269; *Audacieux*, Fr., launch, xii 1107; *Avant-Garde*, Fr., coal consumption, iii 273; comparative data.....ix 35
Bagley, named, x 818; des. and contract trials, xiii 651; full data, xiii 1082; *Bailey*, data, x 818; trials, xiii 472; des., xiii 768; full data, xiii 1082; *Balny*, Fr., comparative data, ix 35; *Barney*, named, x 818; speed, xiii 472; trials, xiii 240; des. and contract trial, xiii 651; full data, xiii 1082; *Bathurst*, Arg. Rep., trial and des., iii 142; *Biddle*, named, x 818; des. and contract trial, xiii 651; full data, xiii 1082; bilge keels on, xiii 201; *Blakely*, named, x 818; launch, xiii 240; full data, xiii 1082; trials, xvi 995; des. and contract trials, xvi 1076; *Boa*, Aus., speed, x 1177; *Bouët Willaumez*, Fr., wreck of, xii 1107; *Bourrasque*, Fr., speed, xiv 325; des., xiv 663; Brazil, two Thornycroft, iii 608; Brazil, five Schichau, des., vii 418; British, fourteen ordered (1892), des. and comparison with former types, iv 834; British, time required to build, iv 117; British, trials of liquid fued in, i 183; British, trials and comparisons, xvi 259, 265; *Buistre*, Rus., speed, xiv 1265
Care of, in reserve, xv 756; *Chevalier*, Fr., des. and trials, vi 585; comparative data, ix 35; Chili, 1896, viii 611; Chili, launch, ix 144; China, two, built by Vulcan Co., trip to Nanking, viii 162; *Circe*, Br., des. and trial, vi 200; *Cirujano Videla*, Chili, note, ix 406; classes compared with British 1892 type (*Adler*, *Dragon*, *Ariete*, *Pinero*, *D7* classes), iv 834; *Condor*, It., progressive trials, xii 77; *Corsair*, Fr., ordered, iv 520; *Craven*, *T. A. M.*, data, x 818; full data, xiii 1082; speed, xii 241; criticism on in English maneuvers, 1888, i 169; *Cushing*, launch and des., ii 127, 215; data, x 818; full data, xiii 1082; boilers, xvi 153, 163; *Cyclone*, Fr., note.....viii 850
Dahlgren, data, x 818; launch and des., xi 781; trial, xi 1083; full data, xiii 1082; *Davis*, data, x 818; boiler accident, x 1175; trials, xi 237, 892; full data, xiii 1082; *Delfin*, Nor., dimensions, ix 432; *De Long*, named, x 818; full data, xiii 1082; contract and standardization trials, xiv 825; *Delphin*, Rus., data, xi 532; *Dragon*, Fr., launch, iv 520; *Dupont*, launch, ix 401; repairs, x 221; data, x 818; full data, xiii 1082; *Durandal*, Fr., note.....viii 850
Eclair, Fr., des., iv 127; electrical propulsion for, x 958, xi 53; *Ericsson*, ii 409, 411, iii 127, 260, 460, 595; launch, vi 421; trials, vi 793; accident to, vii 572; data, x 818; full data.....xiii 1082
Fame, Br., des. and trials, x 226; *Farragut*, data, x 818; launch, x 827; speed, x 1174; trials, xi 232, 892; full data, xiii 1082; *Flibustier*, Fr., des., vii 430, 825; Flotilla, Aus., xvi 997; *Foote*, des. and contract trials, ix 655; repairs, x 220; data, x 818; full data, xiii 1082;

Torpedo Boats.
for Manila (*Bailey*, *Barney*, *Biddle*, *Porter*, *Dupont*), xvi 1304; *Forban*, Fr., des., vi 429; launch, des., trial, vii 825; comparative data, ix 35; *Fox*, data, x 818; trials, xi 892; full data, xiii 1082; French, defects in.....i 184
Gagara, Rus., data, xiv 364; *G 108*, Ger., launch, xiii 1098; German (six), viii 850; German (for China), xi 526; Germany, 1898, x 579; *Goldsborough*, named, x 818; trials, xiii 473; repairs, xiii 769; full data, xiii 1082; machinery accident, xiv 1235; trials and accidents, xv 778; *Gwin*, des. and trials, x 493; launch, x 533; data, x 818; full data.....xiii 1082
Hai, Nor., dimensions, ix 432; *Hajen*, Den., note, viii 612; *Hallebarde*, Fr., note, viii 850; *Hebe*, Br., des. and trial, vi 200; high speed.—Schichau, iv 845; *Hval*, Nor., dimensions.....ix 432
Injeniero Hyatt, Chili, speed, ix 406; data, ix 797; Italy, 1896. .....viii 635
Kabyle, Fr., des., iv 127; *Kasatka*, Rus., data, xi 532; *Kefal*, Rus., data, xiii 304; *Kit*, Rus., data.....xi 532
Lancier, Fr., comparative data, ix 35; *Lansquenet*, Fr., v 1063; data, vi 206, 807; trials, vii 430; *Lossos*, Rus., data..... xiii 304
M2, Fr., data, ix 178; *Mackensie*, launch, x 533; data, x 818; speed, x 827; trials, xi 234, 892; full data, xiii 1082; *McKee*, data, x 818; full data, xiii 1082; *Mangini*, Fr., speed, ix 178; *Manly*, data, xiii 1082; *Mistral*, Fr., launch, xiii 782; trials, xiii 1095; *Morris*, des. and trials, x 502; launch, x 534; data, x 818; full data, xiii 1082; *Mousquetaire*, Fr., des.....iii 604
Natter, Aus., viii 385; trials, viii 806; *Nicholson*, named, x 818; launch, xiii 1085; full data, xiii 1082; *No. 1*, authorization and data, i 236; *No. 2*, dimensions, iii 460; bids, iii 260, 595; *Nos. 3, 4, 5*, des., vi 795; bids, vii 152; *No. 3*, dimensions, viii 799; *Nos. 4* and *5*, launch, ix 140; *Nos. 6, 7* and *8*, des., vii 583; bids, vii 805; *No. 6*, launch, viii 800; *Nos. 9, 10, 11*, bids, viii 599, 800; *Nos. 12* to *18*, bids, viii 601, 801; *Nos. 19, 20, 21* (*Stringham*, *Goldsborough*, *Bailey*), des., ix 402; *Nos. 24* to *35*, named, x 817; data, x 818; bids for, x 1173; new torpedo craft of the British Navy, v 655; *No. 25*, Br., boiler defects in 1892 maneuvers, iv 838; *Nos. 52, 53* and *55*, Br., reboilering, xiv 1250; *Nos. 42* and *61*, Br., bad sea going qualities, i 90; *No. 75*, Br., sunk in 1892 maneuvers, iv 838; *Nos. 91, 92, 93* and *97*, Br., dimensions, vi 615, v 483; *Nos. 94* and *95*, Br., speed, vi 805; *No. 98*, Br., launch, xiii 492; speed, xiii 779; *No. 99*, Br., speed, xiii 779; *No. 107*, Br., speed, xiv 323; *No. 108*, Br., trials, xiv 321; *Nos. 109, 110, 111, 112, 113*, Br., trials, xvi 259; *No. 109*, Br., launch, xiv 960; *No. 110*, Br., launch, xiv 1250; *Nos. 126, 127, 128*, Fr., trial, coal consumption, iii 273; *No. 128*, Fr., comparative data, ix 35; *No. 149*, Fr., boiler, iv 491; comparative data, ix 35; *No. 155*, Fr., des., iv 316; *Nos. 182* to *191*, Fr., des., iv 843; *No. 183*, Fr., comparative data, ix 35; *No. 192*, Fr., vii 430; *Nos. 201, 202* and *203*, Fr., des., ix 811; *No. 223*, Fr., launch, xiv 669; *Nos. 230, 231* and *232*, Fr., data, ix 813; *No. 243*, Fr., Rateau turbines, xvi 647, 659; *No. 245*, Fr. data, xiii 499; *Nos. 254*

Torpedo Boats.
and *256*, Fr., data, xiv 332; *Nos. 278* to *294*, Fr., des., xvi 700; *No. 281*, Fr., trials, xvi 1015; *No. 283*, Fr., trials, xvi 1330; *No. 285*, Fr., launch, xvi 1015; *No. 293*, Fr., trials, xvi 1011; *No. 108*, Ger., speed, xiv 676; Normand, comparative data, ix 35; Norway, three.....viii 200
O'Brien, named, x 818; full data, xiii 1082; oil fuel for, x 208; *Onyx*, Br., des. and trial, vi 200; *Ophir*, Hol., data, xiii 502; *Orage*, Fr., des., iv 127; *Osiotr*, Rus., data.....xiii 304
P35 and *P36*, Fr., data, ix 178; *Pangrango*, Hol., speed, xiii 502; *Porter*, trials, ix 401; data, x 818; repairs, x 221; full data, xiii 1082; progress in.....xi 915
Rafale, Fr., des., xiv 663; *Renard*, Br., des. and trial, vi 200; report on torpedo boats and destroyers.—Linnard, Chandler, xiv 282; request of contractors for increased price, xiv 295; *Rodgers*, progressive trials, ix 684; data, x 818; trials, xi 892; full data, xiii 1082; *Rowan*, launch, x 534; data, x 818; trials, xi 892; full data, xiii 1082; Russian, liquid fuel on, ix 138; Russian, trials..... ii 426
S 26, Ger., capsized, ix 817; *S 108* to *S 113*, Ger., data, xiii 501; *Sarrasin*, Fr., boiler explosion, vi 166; *Seid*, trials, vi 590; *Shubrick*, named, x 818; launch, xi 1088; installing propeller shafting, xii 326; trial, xiii 474; contract trial, xiii 586; full data, xiii 1082; *Siroco*, Fr., data, xiii 782; trials, xiii 1093, 1095; *Skat*, Rus., data, xi 532; *Som*, Rus., data, xi 533; *Somers*, trial, xii 239; full data, xiii 1082; Spanish, competitive speed trials, i 181; speed of building, Br., iv 117; *Stockton*, named, x 818; trials, xiii 256; full data, xiii 1082; strength of, v 483, xiv 1186; *Stringham*, data, x 818; launch, xi 781; accident on trial, xi 902; boiler accident, xiii 770; engine accident, xiii 260; full data, xiii 1082; *Sunderland*, Br., des. and trials.....ii 244
Talbot, des. and trials, x 493; launch, x 533; data, x 818; full data, xiii 1082; *Thenard*, Fr , contract for, viii 192; third-class, for *Maine* and *Texas*, v 729, vii 24; *Thornton*, named, x 818; launch, xii 825; contract trial, xiii 586; full data, xiii 1082; minor accidents on trial, xiv 304; Thornycroft, trials, vi 590; *Tingey*, named, x 818; launch, xiii 474; full data, xiii 1082; contract trial, xvi 50; *Tourmente*, Fr., trial, vi 619; trials, 1898, Br., xi 253; trials, Br., comment on speed results, xi 522; *Trombe*, Fr., grounding, xiii 293; trials, xiii 1095; Turkish, ii 113; des., iii 284; *Turbinia*, ix 135; *Typhon*, Fr., launch, xiii 782; speed.....xiv 332
U. S., general data.....xiii 1082
Various navies, fast, iv 835; very fast, for Italy and Russia, built by Schichau, iv 845; vibrations in engines, v 977; *Viper*, Br., data, xii 1103; *Viper*, Aus., Yarrow, viii 806; trials, viii 384; *Voron*, Rus., speed.....xiv 685
Wilkes, named, x 818; full data, xiii 1082; launch, xiii 1084; contract and standardization trial, xiv 856; *Winslow*, trials, x 219; repairs, x 221; data, x 818; full data.....xiii 1082
Yarrow, Rateau turbines, xvi 647, 660; *Yastreb*, Rus., trials.....xiv 365
Zouave, Fr., trials.....iv 527

Torpedo cruisers: *Agordat*, It., trials, xiii 787; *Cassini*, Fr., preliminary trials, vii 430; breakdown, viii 191; trial, viii 405; China, ix 145; *Jaguar*, Aus., launch, ix 405; *Komet*, Ger., speed, vii 828; *No. 1*, ii 409; des., ii 411, iii 127; *Pelenk-i-deria*, Tur., speed, viii 856; *Satellit*, Aus., des., vi 423; *Zenta*, Aus., launch and des.....ix 796
Torpedo depôt ships: *Foudre*, Fr., iv 126; *Vulcan*, Br., repairs to..iv 118; *Yenesei*, Rus., trials.....xiv 366
Torpedo gunboats: vii 339; French and British, iv 301; British, iii 598; *Agordat*, It., trials, xiii 1117; *Alarm*, Br., launch, iv 832; trials, v 748; *Almirante Simpson*, Chili, launch, viii 386; speed, viii 611; *Caprera*, It., launch, vi 620; *Caramaru*, Brazil, launch, viii 611; *Don Alvaro de Bazan*, Sp., launch and des., ix 825; *Doña Maria de Molino*, Sp., launch, viii 855; *D'Iberville*, Fr., launch, v 1063; des. and trials, vi 806; *Dryad*, Br., des., iv 833; launch and des., vi 614; *Gleaner*, Br., trials, iv 120; *Halcyon*, Br., des., iv 835; trial, vi 614; *Harrier*, Br., des., iv 833; launch and des., vi 426; trials, vi 803; *Hazard*, Br., des., iv 833; trials, vi 426; *Hussar*, Br., des., iv 833; *Jaseur*, Br., launch, iv 833; des. and trial, vi 200; *Jason*, Br., des. and trial, vi 200; *Leda*, Br., launch, iv 832; trial, v 1060; *Marqués de la Victoria*, Sp., launch, ix 437; *Onyx*, Br., launch, iv 833; *Plassy*, Br., launch and des., ii 421; *Salamander*, Br., boiler change, viii 620; *Seagull*, Br., boilers, viii 172; trials, xii 246, 562; horsepower, xii 252; *Sharpshooter*, Br., repairs, vi 203; data, vi 804; *Sheldrake*, Br., trials, xi 250, 1104; *Skipjack*, Br., trials, xii 246; *Spanker*, Br., new boilers, vii 821; trials, viii 392, 835; *Speedy*, Br., launch and des., v 684; des. and trials, vi 199; trials, v 1060, vi 427
Torpedo tubes, abandoned on new battleships.....xiv 296
Torpedoes, Swedish, new.....xiii 465
Torsional vibrations: of shafting of marine engines, xiv 721; of shafts.—Gümbel.....xiv 432
Total weight of machinery per I.H.P. in various classes of vessels.....ix 692
Tourmente, Fr., trial.....vi 619
Towne boilers: tests, ii 170; des., ii 177; Windom, v 988; for small installations.....xiv 426
Towne, N. P., Chief Engr., U. S. N.—Discussion, some lessons from Samoa, i 215; discussion, trial trips and the lessons to be learned from them, iii 156; discussion, air pumps.....vi 765
Towing steamers for Yukon service.....x 740
Trafalgar, Br., des. and trial, i 254; power and speed, vi 491; coal consumption.....xiii 1029, 1031, 1032
Traffic in the Suez Canal.....v 716
"Train" of fleets.....xvi 956
Train resistance.....xi 202
Training: and education of naval officers, xv 902; engineer's force on repair ships, xiv 1047; naval officers, British Admiralty scheme, xv 144; of engine-room artificers, xvi 646; ships: for engineers force, *Banshee*, *Ferret*, *Lynx*, *Sharpshooter*, Br., vii 821; Rus.....xiii 304
Transatlantic record: iv 494, 792; westward.....vii 569

Transatlantic steamers; passenger, xi 905; hull and machinery data...xiv 702
Transmission and distribution of power on modern ships.—Soliani, translation, Worthington.....iv 173
Transmission, electrical, of power in engineering shops.....x 1128
Transmission, electric, in factories and mills.....xii 402
Transmission, electric, of power for navy yards.....xiv 448, 814, 1109
Transmission of heat through tube plates.—Durston, v 436; discussion, Yarrow, v 454; Stromeyer, 458; Langton, 459; Gray, 460; Scott, 460; Long, 461; Seaton, 461; Joy, 462; Howden, 462; reply to discussion, Durston.....v 463
Transmission of power electric, and electric lighting.....vi 550
Transportation: data, Great Lakes, v 144; on the Lakes, cost of.....x 734
Trave, mer. str., broken crank shaft.....v 188
Traveling gantry at Harland & Wolff's.....x 525
Treatment: of boilers, rules for, iv 696; of non-algebraic curves for maxima and minima by the use of ordinates.—Durand, iv 71; of steel, correct.....xiv 138
Trehouart, Fr., des, ii 422; launch, v 750; name changed to *Amiral Tréhouart*.....viii 403
Trent, Br., des.....i 266
Trent, mer. str., launch.....xi 1121
Trenton, at Samoa, i 211; boiler weights.....iv 703
Trenton, *Wampanoag*, and cruiser *No. 13*, comparative data.....iv 737
Trial data of steamships.—Lincoln.....vi 590
Trial of a turbo-generator after twelve months working.....xiii 722
Trial of the Belleville boilers on H. M. S. *Sharpshooter*.....viii 379
Trials.
Aboukir, Br., xiii 717, xiv 206; *Aco*, mer. str., vii 441; *Adder*, contract, xv 39; *Adler*, Rus., ii 426; *Admiral Oushakoff*, Rus., vii 839; *Aegir*, Ger., ix 813; *Africa* (two), mer. str., vi 590; *Agordat*, It., xiii 787, 1117; *Akatsuki*, Jap., xiv 343; *Alabama*, xii 825; preliminary, xi 1087; contract, xii 855; progressive, xiv 181; *Alarm*, Br., v 748, vi 200; *Albany*, xii 236, 281; *Albatross*, Br., xiii 271; *Albatross*, Fish Com. str., vi 497; *Albemarle*, Br., xvi 258, 260; *Alberta*, iv 860; *Albion*, Br., xiii 277, xiv 206; *Alert*, Br., vii 428, viii 172; *Alma*, mer. str., vii 191, 441; *Algerine*, Br., viii 392; *Almirante Condel*, Chili, ii 586; *Almirante Oquendo*, Sp., vii 841, viii 638; *Almirante Simpson*, Chili, viii 611; *Almy*, yacht, iv 131; *Amiral Cecilé*, Fr., i 180; *Amiral Gueydon*, Fr., preliminary, xiv 1254; *Amiral Pothuau*, Fr., ix 424; *Amiral Tréhouart*, Fr., viii 403, 625; *Ammiraglio di San Bon*, It., xiii 1118, xiv 339; *Amphitrite*, Br., xi 377, xii 246; *Anacreon*, Rus., ii 426; *Andrea Doria*, It., ii 423; *Andromeda*, Br., xi 243, 322; *Angler*, Br., x 858; *Annapolis*, contract, ix 560; *Antelope*, Br., vi 200; *Aquilon*, Fr., viii 405; *Arcturus*, yacht, viii 213; *Ardent*, Br., xi 328; official, vii 169, 423; *Aretusa*, It., vi 208; *Argonaut*, Br., xi 243, 247, 361; *Argonaute*, Fr., vi 619; *Ariadne*, Br., xi 246, xii 246; *Ariadne*, Ger., xiii 782, xiv 333; *Arkansas*, xiv 946; contract and progressive, xiv 1172; *Arrogant*,

Trials.
Br., ix 802; *Arun*, Br., xvi 259; *Asashio*, Jap., xiv 677; *Assam*, mer. str., vi 590; *Astraea*, Br., vi 199; *Asturia*, mer. str., viii 649; *Atlanta*, delayed, i 253; measured mile, i 353, 357; ice machine, iv 775; *Augjulli*, mer. str., vi 590; *Australia*, Br.....i 180, iv 278
Bacchante, Br., xiv 206, 308; *Bagley*, contract, xiii 651; *Bailey*, xiii 472; *Bainbridge*, contract and standardization xiv 1003; *Baltimore*, i 250, 337, iii 582; second, ii 122; *Bancroft*, progressive, v 204; contract, standardized screw, v 365; *Banshee*, Br., vii 424; *Barfleur*, Br., vi 182, 197; *Barham*, Br., ii 421, v 517, 743, xi 1102, xii 246; *Barney*, xiii 240; contract, xiii 651; *Barracouta*, Br., ii 232; *Barrosa*, Br., ii 583; *Barry*, contract and standardization, xiv 1003; *Basilisk*, Br., i 357; *Bat*, Br., ix 806; *Bathurst*, Arg. Rep., iii 142; *Beagle*, Br., i 357; *Bedford*, Br., xiv 949, 1244; Belleville boilers, evaporative, vii 791; *Bellona*, Br., xii 246; *Bennington*, iii 206; *Bergen*, ferryboat, ii 251; *Berwick*, Br., xvi 258; *Biddle*, contract, xiii 651; *Blackwater*, Br., xvi 259; *Blake*, Br., iv 121, viii 168; Blake high-duty pumping engine, Newton, Mass., v 465; Blake pumping engine, Newton, Mass., v 802; *Blakely*, xvi 995, 1076; *Blanche*, Br., ii 234, xiii 274; *Blanco Encalada*, Chili, vi 602, vii 154; *Blenheim*, Br., iv 306, 831; correction of data, v 508; *Bogatyr*, Rus., xiv 682; boilers, comparative, *Garibaldi* and *Varese*, It., xiv 980; *Bonaventure*, Br., vi 803; *Boston*, iii 582; interrupted, i 252; measured mile, i 354; *Bouvines*, Fr., vii 604, viii 403; *Boxer*, Br., vii 169, 715; *Bramble*, Br., xii 246; *Brazen*, Br., xiii 271; *Brennus*, Fr., viii 186; *Brooklyn*, ix 400; contract, viii 727, 741; *Brilliant*, Br., iv 832; British Admiralty requirements for new destroyers, viii 399; British battleships, vi 177; British war ships, machinery of, 1899, xi 304; British Mediterranean fleet, full-power, viii 795; British ordnance, vi 168; *Britomart*, Br., xii 247, xiii 274; *Bruiser*, Br., vii 419; *Buda-Pest*, Aus., x 222; *Buenos Aires*, Arg. Rep., vii 806, viii 607; *Buicella*, mer. str., vi 590; *Bugeaud*, Fr., viii 404; *Bulfinch*, Br., xiii 271, xiv 208; *Bulwark*, Br., xiii 717, xiv 206; *Bulwark* class, Br.....xi 320
Caesar, Br., xi 318, 801; *Campania*, mer. str., v 385; *Camperdown*, Br., endurance, iii 132; *Canopus*, Br., xi 1100, xii 246; *Canopus* class, Br., xi 320; *Capitan Muniz Gamero*, Chili, viii 807; *Capitan Orella*, Chili, viii 807; *Capitan Prat*, Chili, v 231; *Caprera*, It., vii 832; *Carinthia*, mer. str., vii 843; *Carnot*, Fr., viii 625, ix 174; *Casabianca*, Fr., viii 405; *Cassini*, Fr., viii 191, 405; preliminary, vii 430; *Castine*, contract, v 846; *Catinat*, Fr., x 577; *Cécille*, Fr., i 180, iii 135, v 504; *Centurion*, Br., v 1044, vi 182; *Ceres*, mer. str., vi 590; *Challenger*, Br., xvi 258; *Chamois*, Br., ix 805; *Chanda*, mer. str., vi 590; *Charger*, Br., xi 328, xiv 208; *Charlemagne*, Fr., x 875; *Charles V*, mer. str., vi 590; *Charles Martel*, Fr., preliminary, viii 847: *Charleston* (old), i 310, iii 582; preliminary, i 250; *Charybdis*, Br., vi 605; *Chasseloup-Laubat*, Fr., vii 429; *Chateaurenault*, Fr., xiii 1092; xiv 664, 1253; *Chauncey*, contract and standardization, xiv 1003; *Chelydia*, mer. str., vi 590; *Chesapeake*, mer. str., vii 853; *Chevalier*, Fr., vi

Trials.
585; *Chicago*, iii 582; measured mile, i 354; *Chicora*, mer. str., iv 864; *Chilka*, mer. str., vi 590; *Circe*, Br., v 510, 512, vi 200, xvi 258; *City of Alpena*, mer. str., v 975; *Cleveland*, contract, xv 1110; *Clio*, Br., xvi 258; *Coetlogon*, Fr., vi 618; *Colchester*, mer. str., ii 340, iv 426; *Colaba*, mer. str., vi 590; *Colorado*, contract, xvi 1118; *Columbia*, v 1035; contract, vi 1; comparative, of boilers fitted with ordinary and with Serve boiler tubes, ii 569; competitive speed, Spanish torpedo boats, i 181; *Concord*, ii 578, iii 89, 582; conditions, standard, iv 598; *Condor*, Br., xii 564, xiii 274; *Condor*, It., progressive xii 77; *Congo*, mer. str., vi 590; *Contest*, Br., vii 424; *Corcovado*, mer. str., viii 865; *Cornwallis*, Br., xvi 258, 260; *Corrientes*, Arg. Rep., ix 140; *Crane*, Br., x 225; *Cressy*, Br., xiii 274, 277; *Cumberland*, Br., xvi 258; cup races, 1901, xiii 809; *Cushing*, ii 215, iii 459, iv 43; measured mile, iv 17, 43; Thornycroft boiler.....ii 580
Dale, xiv 947; *Daphne*, Br., i 86; *Daring*, Br., vi 611, xi 328; *Daring*, *Decoy*, *Ardent*, *Bruiser*, *Boxer*, comparison, vii 422; *Dasher*, Br., xi 328; *D'Assas*, Fr., x 575; *Davis*, xi 237, 892; *Davout*, Fr., iii 600; *Decatur*, contract, progressive, xiv 57; *Decidée*, Fr., xii 839; *Decoy*, Br., vi 804; defects as shown in *Baltimore*, *Charleston*, *Concord*, *San Francisco*, *Newark* and *Yorktown*, iii 150; *Delfino*, It., xiii 1117; *DeLong*, contract and standardization, xiv 825; *D'Entrecasteaux*, Fr., x 885; *Denver*, contract, xvi 86; second trial, xvi 617; *Descartes*, Fr., viii 626, 849; *Des Moines*, contract, xvi 227; *Desperate*, Br., viii 399, 842; destroyers, Br., xiv 46; *Detroit*, v 500; *Devastation*, Br., v 1046; *Diadem*, Br., x 240, 425, xi 243, 322; *Diana*, Br., viii 833, xi 324; *Diana*, Rus., xiv 683; *D'Iberville*, Fr., vi 806; *Dido*, Br., ix 162, xi 324; *Dolphin*, iii 582; *Don Carlos I*, Port., xi 530; *Donegal*, Br., xvi 258; *Doris*, Br., ix 162, xi 324; *Dove*, Br., xiii 271, xiv 208; *Dragon*, Br., vii 424; *Drake*, Br., xiv 950, 1241; *Dristigheten*, Swed., xiv 690; *Dryad*, Br., vi 614; *Du Chayla*, Fr., preliminary, ix 812; *Duncan*, Br., xvi 260; *Dunvegan Castle*, mer. str., viii 866; *Dupuy de Lôme*, Fr., iv 516, vii 150, 426; *Dwarf*, Br.....xii 246
Eclipse, Br., viii 615, xi 324; *Edgar*, Br., iv 122; *Edgar* class, Br., xi 322; *Elba*, It., vii 831; *Electra*, Br., xiii 271; *Elton*, mer. str., vi 590; *Emanuele Filiberto*, It., xiii 502; *Empress of India*, Br., vi 182; *Endymion*, Br., v 745; engine, notes on analysis, ii 510; *Enterprise* turnabout launch, ii 225; *Entre Rios*, Arg. Rep., viii 805; *Ericsson*, vi 793, vii 572; *Erne*, Br., xvi 259; *Espiègle*, Br., xiii 1107, xiv 206; *Espora*, Arg. Rep., iii 285; *Essex*, Br., xvi 258; *Etruria*, It., viii 198; *Ethel*, yacht, propellers, v 302; *Ettrick*, Br., xvi 259; *Europa*, Br., x 846, xi 243, 322; *Euryalus*, Br., xvi 258; *Exe*, Br., xvi 259; *Exmouth*, Br., xiv 952, 1248, xvi 260; *Express*, Br.....xiv 208
Falcon, Br., xii 838, xiii 271; *Fame*, Br., ix 419, x 226; *Farragut*, xi 232, 892; *Fei Ying*, China, vii 811, viii 162; *Ferret*, Br., vi 613, xi 328; *Fieramosca*, It., ii 236; *Filine*, Rus., xiv 683; *Fleurus*, Fr., vii 150, 173; *Flibustier*, Fr., vii 430; *Flora*, Br., vi 605; *Florida*, contract, xv 546; *Foyle*, Br., xvi 259; *Foote*, contract, ix 655; *Forban*, Fr.,

Trials.
vii 826; *Forbin*, Fr., i 180, 360; *Formidable*, Br., xiii 774, xiv 206; *Formidable* class, Br., xi 320; *Foudre*, Fr., ix 176; *Fox*, xi 892; *Fox*, Br., vi 802, xi 892; *Franz Josef I*, Aus., iii 136; *Friesland*, Hol., x 263; French cruisers, 1895, vii 150; French, contract requirements, iv 481; French methods for naval vessels, vii 44; *Freya*, Ger., xiii 294, 500; *Friant*, Fr., vii 171, 429, viii 375; preliminary, vi 807; official, vii 429; *Fuji*, Jap., ix 428; *Fung-shun*, mer. str., vi 590; *Furious*, Br., x 859, xi 243; *Furor*, Sp., ix 189; *Fusi Yama*, mer. str.....ii 340, iv 426
Gagara, Rus., xiv 683; *Galatea*, Br., v 743, iv 278; *Garibaldi*, Arg. Rep., viii 803; *Garibaldi*, It., xiv 340; *Gaulois*, Fr., x 877; *Gazelle*, Ger., xiii 294; *Geier*, Ger., viii 192, 631; *Geiser*, Den., Thornycroft boilers, v 165; *General Pel*, mer. str., vi 590; *Georgée Pobeidonosels*, Rus., viii 635; *German*, mer. str., vi 590; *Gibraltar*, Br., v 738; *Gladiator*, Br., xii 246; *Glasgow*, mer. str., vi 590; *Gleaner*, Br., iv 120; *Glory*, Br., xiii 274; *Goa*, mer. str., vi 590; *Goldsborough*, xiii 473; preliminary, xv 778; *Goliath*, Br., xii 246, 248; *Good Hope*, Br., xiv 619, 950, 1241; *Gossamer*, Br., iii 598; *Grafton*, Br., v 744; *Grampus*, contract, standardization, xv 584; *Grand Duchess*, mer. str., ix 194; *Grasshopper*, Br., i 261; *Gresham*, U. S. R. C., contract, ix 253; *Greyhound*, Br., xiv 208; *Guardia Marina Riquelme*, Chili, ix 143; Gunboats, river, stern wheel, Fr., iv 523; *Gwin*, contract..... x 493
Habsburg, Aus., xiv 1238; *Halcyon*, Br., vi 614; *Handy*, Br., viii 396; *Hannibal*, Br., x 227, xi 330; *Hardy*, Br., viii 620; *Hart*, Br., viii 180, 396; *Harrier*, Br., vi 803; *Hasty*, Br., xiv 208; *Hatsuse*, Jap., xiii 301; *Haughty*, Br., viii 180, 397; *Havock*, Br., v 1056, vii 426, xi 328, xiii 271; *Hawea*, mer. str., vi 590; *Hazard*, Br., vi 426; *Hebe*, Br., vi 200; *Helena*, contract, ix 360; *Hercules*, Br., v 220, vi 493; *Hermes*, Br., xi 789, xii 246; *Hermione*, Br., vii 815; *Highflyer*, Br., xi 789, xii 246, 563; *Hoche*, Fr., iii 269, xii, 1105; *Hogue*, Br., xiv 206, 312; *Hohenzollern*, Ger., vii 431, xiv 116; *Holland*, xiii 243; *Hood*, Br., vi 182; *Hopkins*, contract and standardization, xv 694; *Hornet*, Br., vi 424, vii 426, xi 328; *Howe*, Br., endurance, iii 133; *Hudson*, U. S. R. C., v 703; *Hull*, contract and standardization, xv 694; *Hunter*, Br., viii 396; *Hyacinth*, Br., xii 246, xiii 280, 1004; *Hyacinth* and *Minerva*, Br., xiii 698, xiv 638; second report.....xiv 458, 473-4
Ignazio Florio, mer. str., viii 869; *Illinois*, preliminary, xiii 472; contract, xiii 559; *Illustrious*, Br., x 550, xi 243, 320; *Implacable*, Br., xiii 488, xiv 206; *Inchdune* and *Inchmarlo*, xiii 159; *Inchmona*, mer. str., viii 652; *Indefatigable*, Br., iv 120; *Indiana*, vi 421; contract, vii 637; *Infanta Maria Teresa*, Sp., v 960, vi 630; *Iona*, mer. str., iii 374, iv 426; *Iowa*, ix 400, x 220; contract, ix 453; *Iphegenia*, Br., failure, boiler defects, iv 837; *Irresistible*, Br., xiv 206; *Iris*, ii 234; *Iris*, mer. str., vi 590; *Isis*, Br., xi 324; *Itchen*, Br., xvi 259; *Itsukushima*, Jap.....iii 145
Janus, Br., viii 835, xi 328; *Jaseur*, Br., vi 200; *Jason*, Br., v 226, vi 200, xvi 258; *Jauréguiberry*, Fr., preliminary, viii 403, 624, ix 421; *Jemmapes*, Fr., vi 805, vii 402; *Jena*, Fr., xiii 1092; *Julio, 9 de*, Arg.

Trials.
Rep., v 501; *Juno*, Br., xi 324; *Jupiter*, Br., ix 406, xi 318; *Jurien de la Graviere*, Fr.....xiv 967
Kaiser Barbarossa, Ger., xiii 783, xiv 333; *Kaiser Frederich III*, Ger., xi 255; *Kaiser Karl VI*, Aus., xii 826, xiii 262; *Kaiser Karl der Grosse*, Ger., xiv 675; *Kaiserin Augusta*, Ger., iv 846, viii 627; *Kaiserin und Konigin Maria Theresia*, Aus., vii 153; *Kangaroo*, Br., xiv 208; *Kassarski*, Rus., ii 426, iii 281; *Kasumi*, Jap., xiv 343; *Katahdin*, vii 804; contract, viii 1; progressive, with propellers Nos. 2 and 3, viii 19; *Kearsarge*, contract, xi 823, xii 548, progressive, xiv 181; *Kentucky*, xi 1082, xii 823, xiv 298; contract, xii 1; *Kherson*, mer. str., viii 639; *Khrabry*, Rus., ix 823; *King Alfred*, Br., contract, xiv 1239; *Komet*, Ger., vii 828; *Korea*, mer. str., xiv 394; *Krouprintz*, mer. str.....vi 590
La Belle Sauvage, yacht, vii 199; *La Cecille*, Fr., iii 136; Lagrafel and Lagrafel-D'Allest boilers, v 949; *Lancaster*, Br., xvi 258; *Landrail*, Br., i 261; *Lansquenet*, Fr., vi 807, vii 430; *Lapwing*, Br., i 260; *Latona*, Br., iii 266; *Latouche-Tréville*, Fr., vii 150, 172, 429; *Lavoisier*, Fr., x 574; *Lawrence*, contract, standardization, xv 667; *Leda*, Br., v 1060, vi 200, xvi 258; *Lee*, Br., xiii 271; *Leviathan*, Br., xiv 950, 1241; contract, xiv 955; *Levrier*, Fr., torpedo scout, iv 845; *Libertad*, Arg. Rep., v 230; *Libertad* (now *Triumph*), Br., xvi 265; *Lightning*, Br., viii 172, 835; *Liguria*, It., viii 199; *Liguria*, mer. str., v 1075; *Lively*, Br., xiii 491, xiv 208; *Locust*, Br., x 571; *Lombardia*, It., viii 198; *London*, Br., xiv 641; *Lynx*, Br., preliminary, vi 614, 804, vii 821
Macdonough, contract and standardization, xv 667; *Machias*, v 720; contract, v 846; *Mackenzie*, xi 234, 892; *Magicienne*, Br., i 178; defects, i 255; *Magnet*, Aus., viii 805; *Magnificent*, Br., vii 811, xi 318; *Magpie*, Br., i 261; *Maine* (old), dock, v 719; official, vi 792; contract, vii 1; *Maine*, contract trials, xiv 1123; progressive, xvi 526; *Maine*, mer. str., iv 323; *Majestic*, Br., vii 812, viii 811, xi 318; *Mallard*, Br., ix 804; *Manning*, U. S. R. C., contract, ix 711; *Manora*, mer. str., vi 590; *Marathon*, Br., i 256; *Marblehead*, contract, vi 129; *Marceau*, Fr., iii 273; *Marco Polo*, It., viii 633; *Margarita*, yacht, viii 873; *Marietta*, contract, progressive, ix 641; marine engine.—Kennedy, iii 374; *Mars*, Br., ix 407, xi 318; *Massachusetts*, dock, vi 602; contract, viii 237; progressive, xiv 181; *Masséna*, Fr., preliminary, x 576, 878; *McCulloch*, U. S. R. C., contract, ix 711; measured mile, Newport, *Atlanta*, *Boston*, *Chicago*, *Yorktown*, i 352; *Medea*, Br., i 87; boiler defects, i 255; *Medusa*, Br., i 178, 255; *Merkara*, mer. str., vi 590; *Melampus*, Br., iii 460; *Melpomene*, Br., i 257; methods of conducting, xvi 32; *Meteor*, iv 426; *Minerva*, Br., viii 832, xi 324, xii 563, xiii 489, 832, 1004; and *Hyacinth*, Br., xiii 698; second report, xiv, 458, 473-4, xiv 638; *Minneapolis*, contract, vi 598, 702; *Missiones*, Arg. Rep., viii 805; *Missouri*, contract, xv 1185; *Mistral*, Fr., xiii 1095; *Moccasin*, contract, xv 39; *Mode*, Swed., xiv 1266; *Monarch*, Aus., x 222; *Monarch*, Br., vi 802; *Mongolia*, mer. str., xvi 238; *Monmouth*, Br., xvi 258; *Monsoon*, yacht, vii 629; *Montagu*, Br.,

Trials.
xvi 260; *Montcalm*, Fr., xiii 1091, xiv 329; *Monterey*, v 115; *Morris*, contract, x 502; *Mutine*, Br., xiv 206; *Myrmidon*, Br.....xiv 208
Nashville, contract, ix 574; notes on, ix 791; *Natter*, Aus., viii 806; *Nembo*, It., xiv 341, 1260; *Nemesis*, mer. str., vi 590; *Nevada*, contract, xv 105; *Newark*, iii 99, 582; *New Hampshire*, mer. str., iv 323; *Newport*, contract, progressive, ix 549; *New York*, preliminary, v 499, 613; nickel-steel armor, v 1028; Niclausse safety water-tube boiler, x 110; *Niger*, Br., v 743; *Niji*, Jap., xii 256; *Nile*, mer. str., v 1069; *Niobe*, Br., x 856, xi 243, 322, xiii 297; *Norman*, mer. str., vii 178; *Normannia*, mer. str., ii 237; *Nos. 109, 110, 111, 112, 113*, Br., xvi 259; *Nymphe*, Br., i 86; *Nyrok*, Rus.....xiv 684
Ocean, Br., xi 795, xii 243, 246; *Odin*, Br., xiv 961; official, of U. S. naval vessels, table, iii 582; of the Niclausse safety water-tube boiler. —Whitham, x 110; discussion: McFarland, x 119; Platt, 120; Ward, 121, 126; Theiss, 123; Edson, 124; Meier, 126; of the paddle steamer *Ville de Douvres*.—Kennedy, iv 409; analysis of the results of, iv 539; of the steel cargo steamship *Winifred*.—Haughton, x 982; *Ohio*, contract, xvi 1027; *Olympia*, preliminary, v 1033, vi 241, viii 581; on measured mile, discussion, ii 70, 93; *Onyx*, Br., vi 200; *Ophelia*, mer. str., vi 590; *Ophir*, mer. str., iv 135; *Opossum*, Br., viii 396; *Oregon*, preliminary, vi 602; contract, viii 439; *Orel*, Rus., ii 237; *Orlando*, Br., i 91; *Ormuz*, mer. str., compared with *Ophir*, iv 140; *Ostrich*, Br.....xii 838, xiii 271
P class, Br., i 85, xiii 282; *Pactolus*, Br., x 1197, xi 243, 326; *Pallada*, Rus., xiv 684; *Pallas*, Br., iii 268; *Partenope*, It., ii 423; *Pau-tah*, mer. str., vi 590; *Pandora*, Br., xiii 274, 282, xiv 206; Parson's condensing turbine, v 900, 914; *Partridge*, Br., i 85; *Pascal*, Fr., viii 849, ix 177; *Patria*, Arg. Rep., vi 799; *Paul Jones*, contract and standardization, xiv 773; *Peacock*, Br., i 85; *Pearl*, Br., iii 268; *Pegasus*, Br., xi 243, 326; *Pelayo*, Spain, iii 284; *Pelican*, Aus., iv 319; *Pelorus*, Br., xi 326; *Pennsylvania*, mer. str., xv 557; *Peresviet*, Rus., xiii 305; *Peru*, mer. str., v 235; *Perry*, xiii 473; contract and standardization, xiv 773; *Perseus*, Br., xi 243, 326, xii 246; *Petrel*, i 252, 355, iii 582; *Petrel*, Br., xiii 271; *Phaeton*, Br., viii 492; *Pheasant*, Br., i 85; *Philadelphia*, ii 231, 412, 524, iii 582; *Phoebe*, Br., iii 598; *Phoenix*, Br., viii 171; *Piemonte*, It., i 180, 263; *Piet Hein*, Hol., viii 194; *Pigeon*, Br., i 85; *Pigmy*, Br., i 85; *Pike*, contract, standardization, xv 584; *Pioneer*, Br., xii 246; *Pique*, Br., v 216; *Plover*, Br., i 851; *Plunger*, contract, standardization, xv 859; *Pluton*, Sp., x 270; *Pobieda*, Rus., xiv 689; *Poltava*, Rus., x 1208; *Pomone*, Br., xi 326, xii 246; *Pomona*, mer. str., machinery, vii 436; *Porcupine*, Br., viii 398, 835; *Porpoise*, contract, standardization, xv 859; *Porter*, ix 401; *Possadnik*, Rus., v 228, 752; *Powerful*, Br., viii 613, 813, ix 145, 802, xi 322; *Preble*, contract and standardization, xiv 773; *Presidente Errazuriz*, Chili, iv 530; *Presidente Pinto*, Chili, iv 528; *Pretoria*, mer. str., vi 590; *Prince George*, Br., viii 809, xi 318; *Prince of Wales*, Br., xvi 258; *Prinz Heinrich*, Ger., xiv 1257; *Prinz Heinrich*, mer. str., vii 437;

Trials.
Prinz Regent Luitpold, mer. str., vii 437; progressive, measured-mile or standardized screw vs. measured course with turn, iv 604; progressive, typical vessels, results of, iv 303; *Prometheus*, Br., xi 326, xii 246; *Proserpine*, Br., xi 243, 326; *Psyche*, Br., xi 326, xii 246; *Puri*, mer. str., viii 644; *Pyramus*, Br.....xi 326, xii 246
Quail, Br.....ix 172
Race Horse, Br., xiv 208; *Rainbow*, Br., v 216; *Rainha Amelia*, Port., xiii 790; *Raleigh*, forced draft, viii 298; *Ramillies*, Br., v 515, 739, 1041, vi 182; *Ranger*, Br., viii 397; *Raynhild*, mer. str., vi 590; *Recruit*, Br., xiii 271; *Reina de los Angeles*, mer. str., viii 652; *Renard*, Br., v 1061, vi 200; *Renown*, Br., viii 387, xi 318; *Repulse*, Br., v 512, vi 182; *Resolution*, Br., v 1039, vi 182, 489; *Retribution*, Br., v 217; *Retvizan*, Rus., xiii 1121; *Ré Umberto*, It., vi 207, viii 195; *Revenge*, Br., vi 182; *Richard Peck*, mer. str., iv 857; *Rindjani*, xiii 785; *Rinaldo*, Br., xiv 206; *Ringdove*, Br., ii 422; *Rocket*, Br., vi 805, vii 423, viii 175; *Rodgers*, xi 892; progressive, ix 686; *Roebuck*, Br., xiv 208; *Roland*, mer. str., v 1077; *Rosales*, Arg. Rep., iii 285; *Rosario*, Br., xii 564, xiii 274; *Rotomahana*, mer. str., vi 590; *Royal Oak*, Br., vi 182; *Royal Sovereign*, Br., iv 295, vi 182; *Rowan*, xi 892; *Rurik*, Rus., vii 433; *Russell*, Br.....xiv 657, 963, xvi 260
Sabyholin, mer. str., vi 590; *Salmon*, Br., vii 817; *Samoyede*, Rus., vii 840; *Sandfly*, Br., i 179; *San Francisco*, ii 413, 537, iii 582; *Sanspariel*, Br., i 84; *Santa Fé*, Arg. Rep., viii 609; *Sappho*, Br., iv 830, v 218; *St. George*, Br., vi 198; *St. Louis*, mer. str., vii 843; *St. Paul*, mer. str., vii 843; *Sardegna*, It., vi 620, vii 173; *Scindia*, mer. str., vi 590; *Scottish Hero*, mer. str., vii 852; *Scylla*, Br., v 218; *Seagull*, Br., ii 234, v 715, xii 246, 562, xiv 964; *Seal*, Br., x 237; *Seid*, vi 590; *Shakspeare*, mer. str., vi 590; *Shark*, contract, standardization, xv 859; *Shark*, Br., preliminary, vii 170, vii 423, viii 175; *Sharpshooter*, Br., i 262, vii 822, viii 379; failure, i 357; Belleville boiler, vi 591, vii 601; *Sharpshooter* class, Br., *Sheldrake*, *Skipjack*, *Spanker*, *Speedwell*, ii 234; *Shearwater*, Br., xiii 274, 283; *Shearwater*, yacht, boilers, ii 484; *Sheldrake*, Br., xi 250; *Shirakuma*, Jap., xiv 358; *Shubrick*, contract, progressive, xiii 586; *Shunlee*, mer. str., vi 590; *Sicilia*, It., viii 195; *Sigurd*, mer. str., viii 656; *Sinope*, Rus., ii 236, 424; *Sirdhana*, mer. str., vi 590; *Siren*, Br., xiv 208; *Sirene*, Fr., xiii 1094; *Siroco*, Fr., xiii 1093, 1095; *Skagul*, mer. str., vi 590; *Skipjack*, Br., xii 246; *Snapper*, Br., viii 844; *Sokol*, Rus., vii 833; *Som*, Rus., xii 576; *Somers*, xii 239; *Spanker*, Br., ii 582, viii 392, 835; *Sparrowhawk*, Br., viii 842; *Spartan*, Br., iv 300; *Spartiate*, Br., xii 1103, xiii 274, xiv 965; speed.—Taylor, iv 587; speed of fast ships, ii 68, 333; speed, register for.—Weavor, iii 86; *Speedwell*, Br., ii 234, xiii 274; *Speedy*, Br., v 1060, vi 199, 427, vii 416; *Spetzia*, Gr., iv 320; *Spider*, Br., i 179; *Spiteful*, Br., xii 245; *Spitfire*, Br., viii 843, full power, ix 690; *Spokane*, mer. str., xiv 999; *Spree*, mer. str., ii 589; *Sprightly*, Br., xiv 208; *Stag*, Br., xiii 271; standardized screw method, iv 587, vii 41; *Star*, Br., ix 418; preliminary, x 230; *Starfish*, Br., vii 818; steam boiler, code

Trials.
of 1899, xii 37; steam barge, progressive, Navy Yard, New York, i 1; steam launch, light-draught, speed and power, x 183; *Stewart*, xiv 1237, xv 111; *Stockton*, xiii 256; *Sturgeon*, Br., vii 425, 602; *Suchet*, Fr., vi 428; *Suffolk*, Br., xvi 258; *Sultan*, Br., vii 600; *Sunderland*, Br., ii 244; *Sunfish*, Br., vii 822, viii 181; *Surly*, Br., vii 423, viii 175; *Surprise*, Fr., viii 405; *Sutlej*, Br., xiii 490, 776, xiv 206; *Swordfish*, Br., viii 618, 843; full power, ix 691; *Sybille*, Br., iv 304, v 519; *Sylvania*, mer. str., vii 843; *Syren*, Br.....xiii 1112, xiv 332
Tacoma, contract, xvi 1; *Tage*, Fr., iii 462; *Talbot*, contract, x 493; *Talbot*, Br., viii 616; xi 324; *Tartar*, mer. str., ii 340, iv 426; *Tartare* and *Etna*, comparative, paddle wheel, iv 580; *Taupo*, mer. str., vi 590; *Tekoa*, mer. str., iv 134; *Temerario*, Sp., torpedo gun vessel, iv 319; *Teniente Serrano*, Chili, ix 143; *Terrible*, Br., viii 811, ix 153, x 562, 1180, xi 322, xiv 298; preliminary, viii 613; *Terror*, Sp., ix 189; *Teviot*, Br., xvi 259; *Texas*, dock, vi 421, 600; contract, viii 82; *Theseus*, Br., vi 198; *Thetis*, Ger., xiv 333; *Thistle*, Br., xi 1106, xii 246; *Thorn*, Br., xiii 271; *Thornton*, xiv 304; contract, progressive, xiii 586; *Thrasher*, Br., ix 172; *Thunderer*, Br., v 453; *Tiger*, Br., xiii 271; *Tingey*, contract, xvi 50; *Torch*, Br., vii 601, viii 172; torpedo boat destroyers, British, vii 796; torpedo boats: aluminum, vi 788; *No. 108*, Br., xiv 321; *No. 128*, Fr., des. and trial for coal consumption, iii 273; Thornycroft, vi 590, vii 442; British, 1898, xi 253; British, comment on speed results, xi 522; Turkish, ii 120; *Tourmente*, Fr., vi 619; *Trafalgar*, Br., i 254; trip, liquid-fuel-burning apparatus, xiv 268; *Tri Sviatitelia*, Rus., des. and trial, ix 188; *Triumph*, Br., ex *Libertad*, xvi 265; *Trombe*, Fr., xiii 1095; *Troude*, Fr., iii 270, 601; *Truxtun*, contract and progressive, xiv 1083; *Turbine*, It., xiv 989, 1262; *Turbinia*, turbines, ix 379; *Turret Cape*, mer. str.....vii 620
Umbria, It., vi 809, viii 197; *Umbria*, mer. str., iii 293, vi 590; *Undaunted*, Br., ii 235; *Urd*, mer. str., vi 590; *Usk*, Br.....xvi 259
Valkyrien, Nor., viii 851; *Varese*, It., xiii 299, xiv 340; *Variag*, Rus., xii 841, 1009; *Vautour*, Fr., ii 236; *Velox*, Br., xvi 259; *Venerable*, Br., xiv 966; *Vengeance*, Br., xiii 779, 1107, xiv 206; *Venus*, Br., viii 830, x 230, xi 324; *Vestal*, Br., xiii 274, 284; *Vesuvius*, i 82, ii 231, 417, iii 582; *Vicksburg*, contract, progressive, ix 549; *Victoria*, Br., i 84; *Victoria and Albert*, Br., xiii 274; *Victorious*, Br., viii 808, xi 318; *Victory*, mer. str., vii 765; *Viente y Cinco de Mayo*, Arg. Rep., iii 140; *Vigilant*, Br., xiii 271; *Ville de Douvres*, mer. str., iv 409; analysis, iv 539; *Vindictive*, Br., xi 243; *Viper*, Aus., viii 384; *Viper*, Br., xii 565, xiii 284, 780; *Virago*, Br., ix 171; *Viscaya*, Sp., vi 810; *Vixen*, Br., xiv 208; *Vulcan*, Br.....iii 461, 599, v 514
Wacouta, yacht, xiv 1151; *Wakatipu*, mer. str., vi 590; *Waldo, L. C.*, mer. str., viii 858; *Walleroo*, Br., iii 129; *Wampanoag*, iv 713, 735; warships, 1903, Br., xvi 256; conditions of, xvi 1285; *Wattignies*, Fr., iv 844; *Wheeling*, contract, progressive, ix 641; *Whipple*, contract and progressive, xiv 1083; *Widgeon*, Br., trials, ii 235; *Wien*, Aus., x 222; *Wild Duck*, yacht, vii 91; *Wilkes*, contract and

Trials.
standardization, xiv 856; *Wilmington*, contract, ix 360; *Winifred*, mer. str., x 982; *Winslow*, x 219; *Wisconsin*, contract, xii 979; *Woewoda*, Rus., trials, v 228, 752; *Wolf*, Br., x 572; *Woodlark*, Br., x 563; *Worden*, contract and progressive, xiv 1083; *Wörth*, Ger., vi 808, vii 430; *Wyoming*, xiv 1237; contract, progressive.....xv 83
Yashima, Jap., ix 818; *Yastreb*, Rus., xiv 365; *Yenesei*, Rus., xiv 366; *Yorktown*, i 137, 252, iii 582; measured mile, i 355; progressive, iv 587; *Concord*, *Bennington*, results compared, iii 216; *Yosemite*, yacht, vii 668; *Yoshino*, Jap.....v 1068
Zélée, Fr., xii 839; *Zenith City*, mer. str., vii 765; *Zephyr*, Br., xiii 271; *Zouave*, Fr., torpedo boat.....iv 527
Trials and experiments made in H. M. S. *Argonaut*.—Durston.....xi 361
Trials at pressures above atmospheric pressure, red-hot furnace-crown experiments.....iii 226
Trials of the Lake steamships *Zenith City* and *Victory*.—Bryan.....vii 765
Trial trips and the lessons to be learned from them.—McFarland, iii 149; discussion: Towne, 156; Mattice, 161; See, 164; Gage, 166; King 167; Webster, 168; Baird, 170; Winchell, 171; Leonard, 175; Chambers, 175; Smith, 176; Carr, 176; Theiss, 178; Weaver.....436
Trial trips, etc., lecture before Naval War College.—McFarland.....vii 33
Tribune, Br., launch and des., iii 264; performance data.....iii 597
Trigonia, mer. str., des., x 920; note.....x 1214
Trinity House yacht, data.....x 937
Triple and multiple screws.—White.....xvi 298
Triple-expansion and single-cylinder engines compared.—Isherwood....v 271
Triple-expansion engine, jacketed, economic efficiency.....v 288
Triple-expansion engines.....iv 718
Triple-expansion pumping engine, experiments on, East London water works.....vii 215
Triple-screw ships and vessels, see also Naval Vessels, Triple-Screw.
Triple-screw ships: Melville, xiii 690; translation, Raynal, xiii 397; French, direction of rotation of wing propellers.....xv 1184
Triple-screw vessels: Busley, viii 782; *Chateaurénault*, Fr., vii 825; *Columbia*, des. and trials, vi 1; *Favorite*, mer. str., vi 438; *Freya*, Ger., vii 828; *Gaulois*, Fr., viii 848; *Guichen*, Fr., vii 825; in German Navy, viii 550; *Jeanne d'Arc*, Fr., viii 188, *Kaiser Friedrich III*, Ger. (*Preussen*), vii 827, viii 627, 550; *Kaiserin Augusta*, Ger., iv 846, viii 827; *K*, Ger., vii 828, viii 550; *L*, Ger., vii 828, viii 550; *Leipzig*, Ger., vii 827, viii 406, 550; *M*, Ger., viii 551, 631; *Masséna*, Fr., vii 603; *Minneapolis*, vi 598; *N*, Ger., viii 551, 631; *Rossia*, Rus., vii 433, viii 637; *Saint Louis*, Fr., viii 847; *Vineta*, Ger., xiv 215; war steamers, xi 191
Triple screws: iv 289, 315, 516, 839; advantages of, xi 643, xv 663; advantages and disadvantages, nautical, xiii 397; cruisers *Nos. 12* and *13*, *Columbia* and *Minneapolis*, iv 290; remarks on, in connection with *Columbia*.....vi 3
Triple vs. twin screws.....x 1126
Tripoli, It., boiler, comparisons.....vi 410, 413

Tri Sviatitelia, Rus. (*Three Saints*), des. and trial.....ix 188
Triton, Fr., data, xiii 1094; boiler accident.....xiv 968
Triumph, Br., floating base for destroyers.....xiv 1253
Triumph (ex *Libertad*), Br., des. and trials.....xvi 265
Trocas, mer. str., trial of liquid fuel.....xiv 268
Trombe, Fr., grounding, xiii 293; trial.....xiii 1095
Troop ships, English, age and speed.....vi 168
Tropenas process of steel casting.....x 701
Troude, Fr., des., iii 270; speed.....iii 601
Troy, mer. str., des.....xi 538
Trunnion joint to replace siip joint.....xi 698
Truxtun, destroyer *No. 14*, named, x 818; launch, xiii 770; full data, xiii 1082; speed, xiv 948; contract and progressive trial.....xiv 1083
Truma, mer. str., dimensions.....viii 430
Tsarevitch, Rus., data, xi 533, xiii 307; launch and des.....xiv 509
Tsushima, Jap., des., xiv 354, 357; trials.....xvi 704
Tube: bending machine, Donaldson's, xii 34; cleaners, concerning, xvi 1280; expander, Burton plastic pressure, xiii 208; plates, Kirk experiments with different thicknesses of, v 33; plates, transmission of heat through, v 436; sheets, back, elasticity of, iii 451; sheets, rational design for forced draft, iv 787; sheets, thin, for marine boilers.....v 330
Tubes, boiler: Admiralty tests for, viii 814; arrangement, *Barham* and *Bellona*, Br., v 333; corrosion of, xiv 510; corrosion of in U. S. Navy, xii 587, 907, xiii 333, 822; expanding by steam and electricity, viii 589; experiments, Yarrow, xiv 535; ferruled, success of in British navy, iv 837; ferrules for, v 328; iron vs. steel, iv 488, v 1030; leaky, iv 507; manufacture and inspection, ii 301; nickel-steel and mild steel, xi 633; Niclausse, xiii 380, xv 1164; ordinary compared with "Serve," ii 569; Serve's ribbed, iii 345, iv 288, vi 748; Serve, tests, vi 785; solid-drawn, x 1102; steel, reasons for rapid corrosion of, vii 413; boiler, steel, seamless, limited endurance, xv 417; temperatures, Yarrow experiments, viii 138; Yarrow, expanding and bell-mouthing.....xv 844
Tubes, condenser: xv 202; deterioration of, iv 114; experiments, Yarrow.....xiv 535
Tubes: copper, electrolytic, xii 501; or billets, xii 506; deflection of, xi 491; metallic, production by extrusion, xi 40; spirally welded.....i 207
Tubing, copper and brass, methods of manufacture.....xv 197
Tubulous boilers: iv 708; —Leonard, ii 163; discussion: Isherwood, ii 180; Manning, 194; Loring, 194; Stevenson, 197; Ward, 198; Cowles, 204; Coryell, 206; Griffin, 206; Norton, 210; reply to discussion, Leonard, 211; further discussions: Coryell, ii 206, 371, 555; Bieg, 380; Emery, 382, Baird, 391; Loring, 394; Mattice, 396; Chalker, 557; Ward, 558; further reply to discussion: Leonard, 401; in the French Navy.—Robison.....vii 365
Tugs: 1889, authorization and data, i 223; purchased during Spanish war.....x 534
Tungsten steel: iii 508; and Molybdenum steels.....xii 228
Turbine, It., launch, xiv 343; trials.....xiv 989, 1262

Turbine and reciprocating engines, steam consumption tests.....xvi 1279
Turbine commission, Cunard, report of ..... xvi 634
Turbine-driven vessels, Br.....xiv 658
Turbine engines: efficiency of, report of board, xv 1247; S. S. *Revolution*, design, installation and operation.....xv 1241
Turbine propeller, screw, Thornycroft.....v 479
Turbine propulsion: xvi 294; for marine purposes.—Rateau, xvi 647; progress of.....xiii 168
Turbine, possibilities of the.....xi 766
Turbine vessels, Cunard.....xvi 634
Turbines: and reciprocating engines combined.—Rateau, xvi 652; for experiment, torpedo boats, Fr., xvi 1330; White.....xvi 295
Turbines, steam: xiii 166; action-reaction, xvi 206; advantages of superheating steam, xvi 328; applications of, xiii 139; arrangement of, xvi 632; compared with reciprocating engines for ship propulsion, ix 569; compound, application to marine propulsion, ix 374; compound, advantages, ix 379; condensers for, xvi 176; Curtis, ix 785; Curtis, water-consumption curves, xvi 223; DeLaval, x 211, xiii 114, xvi 214; DeLaval nozzle, xvi 197; economy in cruisers, xvi 1242; for an Atlantic liner, xv 1254; German Navy, xv 603; impulse single-action, xvi 200; in England, x 1110; Janson, xvi 172; literature on, xvi 945; marine, xvi 627; multiple action, xvi 203; Parsons, v 899, xi 919, xii 526, xiv 253, xvi 207, 1095; Parsons marine, xiii 432; Parsons, remarks on, xiv 1216; progress during ten years, xiii 865; Rateau, xvi 210, 653; report on efficiency, xv 1247; reversal of, xvi 191; reversing and maneuvering, xvi 650; Riedler-Stumpf, xvi 217; steam pressures for, xvi 179; superheat for, xvi 180; table of steam velocities, xvi 194; test of Interborough Rapid Transit Co.'s, xvi 182; vacuum for, xvi 181; weight and space, xvi 175; Westinghouse-Parsons.....xiii 112, 125, xvi 207
Turbines, steam, in vessels: *Eden*, Br., trials, xvi 342; *Londonderry*, mer. str., xvi 629; *Lorena*, yacht, xvi 715, 1095; *Manxman*, mer. str., xvi 629, 1023; trials and des., xvi 1339; *Princess Maud*, mer. str., xvi 714; *Queen Alexandra*, mer. str., notes on, xvi 891; *Revolution*, mer. str., des., xv 1241; *Tarantula*, yacht, xvi 1095; *Tarbinia*, steam-consumption, xvi 189; *Turbinia*, yacht, xvi 714, 1095; *Victorian*, mer. str., xvi 713, 1337; unsatisfactory trials .....xvi 1338
Turbinia: turbine steamer, xvi 714; turbine installation.....xvi 1095
Turbinia, Parsons turbine torpedo boat, ix 135; turbine installation, ix 375, 571, xiii 142; cavitation of propellers, ix 678; steam consumption, xvi 186
Turbo: -generator, trial, xiii 722; -motor, Parsons.....xi 919
Turkestan, mer. str., data.. .....xi 269
Turkish Navy, gunboats, vi 810; Niclausse boiler installations.....xv 1173
Turkish torpedo boats: translation, Theiss, ii 113; des.....iii 284
Turnabout launches, White, patent.....ii 222
Turning effort of crank shafts, application of formulae.....vi 334
Turret Cape, mer. str., trials.....vii 620

Turrets: pneumatic system for, *Terror*, ix 14; turning motors, electric, viii 576; *Maine*, vii 23; *Massachusetts*, viii 261; *Oregon*, viii 466; *Texas*, viii 85
Tuscarora, U. S. R. C., launch and des., xiii 1086; trial.....xiv 1237
Tweedy (Yarrow-Schlick), system of balancing engines.....x 481
Twenty-foot boiler tubes for locomotives..... xii 1050
Twin screws: White, xvi 297; effect of direction of turning, x 485; versus triple.....x 1126
Two large floating docks.....ix 780
Two modern methods of introducing feed water into marine boilers.....v 984
Tydeus, mer. str., des.....xiii 806
Typhon, Fr., launch, xiii 782; speed.....xiv 332

U

Ulster, mer. str., des.....viii 657
Ultonia, mer. str., launch, x 916; data .....xi 270
Umbria, It., speed, vi 620; trials, vi 809; data.....viii 197
Umbria, mer. str., des. and trial, iii 293; dimensions and data, iv 102; repair of shaft, v 185; speed, v 1019; data, vi 162; trials, vi 590; comparison of trial with calculated I.H.P.. .....vi 267
Uncas, data.....x 534
Uncancomuck, auxiliary navy, x 538; data.....x 824
Undaunted, Br., des., i 265; trial.....ii 235
Undine, Ger., progress on.....xvi 357
Union, des..... xi 159
Union Dry Dock, Co., lake steamer, data.....viii 208
Union Iron Works, boiler shop.....ii 139
Unique, mer. str., des.....vi 430
United States battleship *Maine*.—Mahony.....xiv 1123
United States battleship *Missouri*, des. and trials.—Bieg.....xv 1185
United States battleship *Ohio*, des., official trial.—Babcock.....xvi 1027
United States Navy, Niclausse boiler installations.....xv 1173
United States Navy, standard steam-cutter machinery.....xiv 37
United States revenue steamer *William Windom*.....v 988
United States Shipbuilding Company.....xiii 467
United States standard bolts, strength of.....xiii 338
United States standard register of shipping, 1899–1900, book received...xi 554
U. S. S. *Cleveland*, general description, official trial.—Bowers.....xv 1110
United States steamer *Fulton*, her design, construction and capacity.—Haswell.....x 422
United States torpedo boat *Morris*.—Gillmor-Anderson.....x 502
United States torpedo boat *Rodgers*.—Parks.....ix 684
United States torpedo boats *Bagley*, *Barney* and *Biddle*.—Wetherbee..xiii 651
United States torpedo boats *Talbot* and *Gwin*.—Anderson-Gillmor.....x 493
United States torpedo-boat destroyers *Bainbridge*, *Barry* and *Chauncey*.—Alexander.....xiv 1003
United States triple-screw protected cruiser *Columbia*.—Carter.....vi 1
University of Michigan, engineering buildings.....xv 908

University of Pennsylvania, engineering building.....xv 578
Unloading record, ore.....xvi 1302
Unserviceable inventions..... xi 979
Unwin, Professor W. Cawthorne.—The determination of the degrees of steam, vii 297; reply to discussions, vii 325; tests of Delta-White anti-friction metal..... v 717
Upper Freeport coal, tests.....xi 97
Urania, It., speed and dimensions.....iii 604
Urania, yacht, des.....vii 629
Urd, mer. str., trials.....vi 590
Use of cellulose on warships.....xiii 195
Use of electricity on board ships.—Eickenradt.....viii 569
Uses of nickel-steel.....xii 108
Use of retarders in Scotch boilers.—Whitham.....viii 777
Use of various vapors in marine engines.....xiv 577
Use of water-tube boilers in the mercantile marine.—Seaton.....ix 667
Useful information.—Willits.....xvi 1157
Usk, Br., trials.....xvi 259, 690
Usugumo, Jap., launch.....xii 259
Utilization of garbage for fuel.....xii 185

V

Vacuum and steam pressure, calibrated for continuous record of marine engines.....ix 6
Vacuum, increase of in condensers.....xvi 948
Vaderland, mer. str., des.....xii 846
Valiant, yacht, des., v 759, 1078; speed.....vi 223
Valkyrie, yacht, *America's* cup races, 1893, v 1004; races with *Vigilant*, v 1005
Valkyrien, Norway, des.....viii 851
Valmy, Fr., des.....ii 235
Valuation of coals.—Lord.....xi 92
Value of superheaters.....xiv 280
Valve-chest repairs, *Concord*.....vi 761
Valve circles, determination of.....iii 552
Valve data: *Colorado*, xvi 1128; *Denver*, xvi 622; *Tacoma*.....xvi 10
Valve diagrams, graphic method of considering obliquity of connecting rods in.....v 991
Valve gears: actuated by connecting rod, iii 544; actuated by connecting rod and crosshead, iii 549; Angström, iii 538; Brown, iii 542; No. I, 542; No. II, 544; No. III, 545; *Charleston*, ii 3; Davidson pump, ix 385; elastic, inertia stresses of, xii 329, 603, 913; Hackworth, iii 535; Joy, iii 549; No. I, 544; No. II, 545; Kirk (Brice-Douglass), iii 551; Klug, iii 540; Marshall, ii 1, 248, iii 538; problems, graphical chart for, xiv 1141; radial, iii 525, xii 757; with one eccentric.....iii 531
Valve, slide, inertia stresses.....vi 272
Valve-stem packings, metallic, principles of good design.....xv 405

Valve, stop and throttle, steam- and hand-operated.....xvi 1240
Vanadium steel.....xiv 272
Vandalia, effect of foul bottom on horsepower and speed, i 74; at Samoa, i 211
Vanes for centrifugal pumps, form of.....iii 558
Vaporization, increased, Orvis system.....iii 295
Vaporized-oil motor, weight and power of.....vi 582
Vapors, use in marine engines.....xiv 577
Varese, Arg. Rep., purchase.....x 830
Varese, It., launch, ix 817; data, xii 1110; trials, xiii 299, xiv 340; Belleville boiler trials.....xiv 980
Variag, Rus., launch, xi 1115; trials, xii 841, 1009; data compared with other protected cruisers, xii 1015; data.....xiv 991
Variation in efficiency due to jacketing the different cylinders of a triple-expansion engine.....iv 486
Varney, William W., status of boards on changes as usually constituted under the contracts for construction of our new Navy.....x 374
Varnishes and paints for coating metals immersed in sea water.....x 782
Varnishes for iron water pipes.....xi 942
Varuna, yacht, des.....ix 210
Vautour, Fr., trials.....ii 236
Veglia, yacht, des.....vii 628
Velox, Br., trials.....xvi 259
Vendenese, yacht, made of aluminum.....vi 165
Venerable, Br., launch and des., xi 1101; trials.....xiv 966
Venezuela, see *Panther*.
Venezuela, shipbuilding, 1901.....xiii 1132
Vengeance, Br., note, ix 602, 802; des., xi 783; trials...xiii 779, 1107, xiv 206
Ventilation: and heating, mechanical, xii 1074; electric for ships, viii 571; in German men-of-war, viii 549; monitors, improvements in *Amphitrite*.....ix 535
Venus, Br., launch, vii 815; referred to with *Juno*, viii 169; trials, viii 830, x 230, xi 324; machinery data.....xi 330
Vera Cruz, Mex., launch and des.....xiv 1262
Vertical engines, advantages of.....iv 725
Vessels: small, motive power for, v 882; under construction, 1898, x 1175; vibration of, iv 246; see Merchant Steamers, Naval Vessels and Yachts.
Vestal, Br., launch, xii 563; trials, xiii 274, 284; speed.....xiv 321
Vesuvius, trials, i 82, ii 231; authorization and data, i 236; machinery space, i 249; horsepower data, ii 417; des., ii 419; engine vibrations, iii 16; engine and boiler data, iii 422, v 652; propeller data, iv 158, 402; steaming radius.....xiii 66
Vibrations: effect on metallic packings, xv 405; engines, v 977; *Hopkins* and *Hull*, Melville's comments, xv 747; in high-speed engines, ix 695; of screw steamers, causes of, iii 12; of steamers.—Schlick, xiii 428; of vessels, iv 246; torsional, of shafts.....xiv 432
Vicker's guns, data.....x 670
Vicksburg, gunboat *No. 11*, des., vii 581; bids and contract, vii 804; named, viii 799; launch, ix 140; des. and contract trials, progressive, ix 549; steaming radius.....xiii 68

Victor Hugo, Fr., compared to *King Alfred*, Br., xiv 314; work on, xvi 351; launch.....xvi 697
Victoria, Br., trials, i 84; sinking of .....v 693, vi 47
Victoria, mer. str., des .....ix 838
Victoria and Albert, yacht, machinery, xi 810; des., xii 1130; trials, xiii 274; note, xiii 780; data.....xiii 1108
Victoria Luise, Ger., launch and des., ix 425; boilers, ix 815; speed, xi 1110, xiii 298; Dürr boilers, xiii 891, 901, xiv 117; rod pressure, xiv 21; cylinder data, xiv 37; coal-consumption and boiler data.....xiv 117
Victorian, turbine steamer, xvi 713; des., xvi 1337; unsatisfactory trials, xvi 1338
Victorium .....xii 524
Victorious, Br., data, vi 423; launch and des., vii 813; trials...viii 808, xi 318
Victory, mer. str., trials.....vii 765
Vienna, mer. str., des.....vi 834
Viente y Cinco de Mayo, Arg. Rep., see *Mayo, 25 de*, trial and des.....iii 140
Vierny, Rus., launch.....viii 200
Vigilancia, mer. str., speed.....vi 217
Vigilant, auxiliary navy, x 539; data.....x 824
Vigilant, Br., trial xiii 271; accident to .....xvi 692
Vigilant, yacht, des., v 652; data, v 998; *America's* cup races, 1893, with *Valkyrie*.....v 1001
Viking, auxiliary navy, x 539; data.....x 824
Ville de Douvres, mer. str., trials, iv 409; analysis of trial results.....iv 539
Ville de la Ciotat, mer. str., Belleville boilers .....viii 153
Vindictive, Br., des., vii 419; boilers and armament, viii 170; trials.....xi 243
Vineta, Ger., note, xi 1110; Dürr boilers, xiii 895, 901; xiv 117; rod pressure, xiv 21; cylinder data, xiv 37; coal-consumption and boiler data, xiv 117; des.....xiv 212
Violet, Br., speed, ix 808, x 231; coal consumption.....x 571
Viper, Aus., trial, viii 384; note.....viii 806
Viper, Br., data, xi 1104, xii 1103; speed, xii 244; trials, xii 565, xiii 284, 780; turbine installation .....xiii 143
Virago, Br., vii 820; launch, viii 181; trials.....ix 171
Virginia, launch and des.....xvi 334, 676
Viscaya, Sp., i 360; des., iii 606; trials.....vi 810
Viscosity and friction of metals.....xii 368, 927
Vitoria, Sp., rebuilding.....x 591
Vittor Pisani, It., launch and des.....vii 830
Vittorio Emmanuele III, It., data, xiii 299; launch.....xvi 1336
Vixen, data, x 534; steaming radius, xiii 68; machinery space, xiii 867; trials.....xiv 208
Voice pipes and call bells, British Navy.....v 179
Voivoda, Rus., see *Woewoda*.
Volage, Br., des .....i 173, 266
Volatile oils in boilers, physical and chemical properties of.....xi 462
Voltage and current for electric power transmission.....xiv 819, 1117
Voltage of electrical appliances.....xiii 1080

Voltaic cell..... .....xi 778
Von Buchholtz, Naval Constructor, Imp. Ger. Navy.—Constructive development of the Dürr boiler in the German Navy.....xiii 881
Von Jaski, Köhn, Marine-Oberbaurath.—Water-tube boiler question in the German Navy.....xiv 74
Voron, Rus., speed.....xiv 685
Voorhees, Philip Randall.—Discussion, experimental station and engineer school, vii 475; obituary.....viii 218
Voyage of H. M. S. *Good Hope*.....xv 259
Voyage with Belleville boilers, *Terrible*, Br.....xvi 1293
Vulcan, auxiliary navy, x 535; data, x 824; des., x 592; note, x 825; naval repair ship.....xiv 1031
Vulcan, Br., repair ship, vii 75; des., iii 461, iv 820; trials, iii 599, v 514; repairs to, iv 118; boiler defects, iv 280; boiler data, iv 507; ferruled boiler tubes.....iv 837
Vulcan class, Br., characteristics.....iii 142
Vulture, Br., data.....vii 820

W

Waban, data .....x 824
Wachsmann, Wm.—Translation, the accident to the *City of Paris*, vi 290; translation: test of wound copper pipes, vii 510; translation, experiments to determine the causes of steam pipe explosions on board German naval vessels, vii 737; translation, experiments on the outflow of steam, xvi 564; translation, port areas for steam engines.....xvi 588
Wacht, Ger., coal-consumption and boiler data.....xiv 116
Wachusett, yacht, dimensions.....viii 663
Wacouta, yacht, des. and trials.....xiv 1151
Wainwright feed heaters.....iv 398
Wakatipu, mer. str., trials.....vi 590
Wake: coefficients, xv 285; currents, vi 262; on the measurement of.....v 869
Waldo, L. C., mer. str., des., viii 423; tests .....viii 858
Walker, William G.—Experiments on the arrangement of the surface of a screw propeller, v 300; reply to discussion.....v 323
Walking-beam, counter balance for turning crank-pins.....xiv 527
Walleroo, Br., trial .....iii 129
Walliker, John F.—Discussion, marine boiler furnaces .....v 418
Walsh coal- and freight-delivery vessel.....xiii 33
Walter Q. Gresham, launch.....viii 803
Wampanoag, engines of.....iv 713, vi 652
Wampanoag, *Trenton* and cruiser *No. 13*, comparative data.....iv 737
Warburton, E. T., Lt. Comdr., U. S. N.—Contract trial of U. S. S. *Charleston* (old), i 310; discussion, of speed trials of fast ships, ii 84; contract trial of the U. S. S. *San Francisco*, ii 537; discussion, experimental station and engineer school, vii 469; obituary .....xvi 717
War College lectures: Edwards, liquid fuel, vii 744; naval engineer officers and "the problem," viii 21; McFarland.....vi 647, vii 33

War conditions to be met by machinery, boilers and personnel.....x 996
Ward boilers: compared with others, xiv 425; compared with Cowles, ii 414; compared with Thornycroft, ii 581; des., ii 177; diagram, ii 418; sizes for steam cutters, U. S. Navy, xiv 37, 44; *Monterey*, des., v 127; tests.....ii 170
Ward, Chas.—Discussion, tubulous boilers, ii 198, 558; discussion, steam consumption of the *Minneapolis*, x 65; discussion, trials of the Niclausse safety water-tube boilers, x 121, 126; speed and power trials of a light-draught steam launch, x 183; discussion, water-tube boilers a necessity.....xi 22
Ward Line steamers.....x 274
Warrant machinists, duties of.....xvi 1176
Warren, B. H., Asst. Engr., U. S. N., retired.—Modern cranes, v 921, vi 147
Warrington, James N.—The propulsive power of screw ships, vi 259; propulsive power.....x 88
Warrior coals, Alabama.....i 120
Warships building in 1901, Br., xiv 196; 1903.....xvi 250
Warships: and auxiliary vessels purchased during Spanish War, x 534; Attwood, book received, xvi 1346; British, conditions of trials, xvi 1285; British, machinery of, vii 322; British, machinery trials, 1899, xi 304; British, steam consumption of auxiliary engines, xi 388; British, steam trials, 1903, xvi 256; coaling of, xiii 1; condensers in, xiv 530; cost of, England and France, xii 181; effect of battle of Yalu on construction of, viii 370; effect of accessories on cost and size, xv 350; endurance of, practical and theoretical, iii 133; hydraulics of the resistance of, xiv 555; logical arrangement of motive power, xi 641; problem of building on the Great Lakes xv 458; rapid coaling of, xvi 944; rules for determining displacement and dimensions, xiv 546; sheathing of, xiii 452; size and speed, increase in, xi 305; steamboat equipment of, xiii 1042; see Naval Vessels.
Warship strength, relative order of.....xvi 335
Warspite, Br., des.....i 172, 265
Wasa, Swed., launch, xiv 367; data.....xiv 691
Washington, des., xiv 941; horsepower, xiv 1237; balance cylinders...xvi 905
Wasp, data.....x 534
Waste gases: from coke ovens, xii 227; of blast furnaces, as fuel for boiler testing.....x 138
Waste of power in marine engines.....iv 655
Watch, quarter and station bills, engineer division.....xiii 930
Watchful, Br., des.....i 267
Water and steam, temperature-entropy diagrams for.....viii 285
Water barge *No. 1*, data.....x 824
Water consumption data: *Amethyst*, *Topaze*, *Sapphire*, *Diamond*, Br., xvi 1250 *Bergen*, ii 291; Corliss boilers, i 308; *Concord*, iii 97; *Cushing*, iv 55; *Diana* and *Hermes*, Br., x ii 735; *Dolphin*, x 74; Ericsson engine with Belleville boiler, ii 477; *Iona*, mer. str., iii 391; marine engines, vii 486; *Minneapolis*, main and auxiliary machinery, x 1; Niclausse boiler tests, x 115; Niclausse test boiler, xi 887; pumping-engine tests,

Washington, D. C., i 57; *Shearwater*, ii 489; *Ville de Douvres*, mer. str., iv 418, 428, 578; Worthington pumping engines.....ii 67
Water: depth on trials, iv 601; effect on of moving body in, i 97; feed- and circulating-, measurement by chemical means, viii 517; for boiler use, xi 225; for transmitting power on shipboard, iv 179; -gauge, boiler, new form of, x 777; hammer in steam pipes, v 362, vii 737; hammer, ruptured stop valve in main steam pipe, *St. Paul*, viii 155; pipes, cast-iron, coatings for, xi 931; -pressure for ship central-power plants, x 95; -proofing paper, new method, xi 227; pure, for ice-making, xiii 208; rams in steam pipes.—Emory, iii 407; resistance to motion of ships.—Froude, xvi 306; -tenders, duties of, xvi 1180; -tight compartments and doors on German men-of-war.....viii 549
Water-tight doors, Admiralty on closing of.....vi 87
Water-tight door between bunkers.....xiii 9
Water-tight doors.—Soliani.....viii 327
Water-tight doors and their danger to modern fighting ships.—Beresford, viii 319; discussion: Wilson, viii 335; White, viii 336; Fitzgerald, viii 338; Fremantle, viii 339; Culomb, viii 339; Martell, viii 340; Seaton, viii 341; Biles, viii 342; Gearing, viii 342; Pilcher, viii 343; reply to discussions .....viii 343
Watertown arsenal: tests of riveted joints, for Bureau Steam Engineering, iv 624; tests of metals.....xiii 189
Water-tube boiler installations of the world's navies.—Dyson.....xiv 493
Water-tube boiler question in the German Navy.—Köhn von Jaski.....xiv 74
Water-tube boilers: iv 708, xiv 244; (authors)—Almy, x 106; discussion, Scott, 627;—Milton, vi 357;—Scott, x 627;—Soliani, vii 97;—Watt, viii 481; discussion:—Durston, 501; Yarrow, 505; Normand, 507; Thornycroft, 508; Robinson, 509; Thom, 509; Blechynden, 510; Lambert, 511; Wingfield, 514; Watkinson, 513;—White, xvi 301; a necessity, a war lesson.—Robison, x 996; discussion: Ward, xi 17; Thornycroft, xi 22; Yarrow, xi 23; D'Allest, xi 25; Platt, xi 27; Hoxie, xi 33; Melville, xi 36; reply to discussion, xi 38; advantages and disadvantages, vi 662; and cylindrical compared, vi 373; and cylindrical compared, *Cameo* and *Hero*, Babcock & Wilcox vs. *Dido*, *Othello* and *Zero*, ix 673; and cylindrical compared, for marine purposes, xiv 409; care of in British Navy, x 523; circulation in, viii 133, 489; durability of, xi 633; efficiency of, xi 994; features combined with cylindrical, for marine purposes, viii 477; for marine purposes, v 931; French view, xiv 536; German Navy, viii 553, xii 571; in British battleships and cruisers, xiv 234; in British destroyers, vii 797; in British Navy, xii 709; in British ships, xiii 732; in foreign navies, xii 743; in high-speed ocean steamers, ix 776; notes on, xvi 133; novel arrangement of feed-water heater in, x 409; problem of combustion in, and a means of its solution, x 723; qualities required for war service, x 1005; requirements, xv 59; (types), Almy, evaporative test, ix 135; Janson, xiv 1192; Miyabara, x 1146; Montupet, xiv 279; Seabury, x 774; temperatures of tubes, viii 138 use of in mercantile marine, ix 667; see Boilers, water-tube.
Water-tube vs. cylindrical boilers for naval vessels.—Cathcart.....xv 924

Watkins.—Discussion, effect of direction of turning of twin screws.....x 491
Watkinson, Prof. W. H.—Circulation in water-tube boilers, viii 489; reply to discussion.....viii 515
Watt-hour, equivalent in mechanical units.....xi 506
Watt, J.—Water-tube boilers, viii 481; reply to discussion, viii 514; discussion, Yarrow's feed-water heater.....x 420
Wattignies, Fr., launch, iii 280; trials.....iv 844
Watts, Philip.—Discussion, design of a fast scout.....xiii 418
Wave form and speed of vessels, effect on, of form of bow.....i 98
Wave making of hulls.....vi 260
Wear of gear teeth.....xii 205
Weaver, W. D., Asst. Engr., U. S. N.—Some problems in propulsion, i 59; discussion, speed trials of fast ships, ii 79; register for speed trials, iii 86; discussion, trial ships.....iii 436
Weaver speed recorder, *Bancroft* trial.....v 377
Webster's clinometer.....iii 348
Webster, Harrie, Comdr., U. S. N.—Discussion, trial trips and the lessons to be learned from them, iii 168; some new alloys considered in their chemical and physical aspects, iii 489; screw propellers of U. S. naval vessels, iv 157; contract trial of the United States battleship *Kentucky*, xii 1; novel method of installing propeller shafting, xii 326; contract trials of the torpedo boats *Shubrick* and *Thornton*, xiii 586; contract trial of the torpedo boat destroyer *Decatur*.....xiv 57
Weekly routine, engineer division.....xvi 1193
Weetamoe, yacht, des.....xiv 706
Weight and space: of air pumps, vi 526; steam turbines.....xvi 175
Weights (general): and analyses of charges for steel castings, i 194; and measures, metric system, xi 467; and power, relative, of electric, compressed-air, and vaporized-oil motors, vi 582; atomic, xi 750; auxiliary machinery on shipboard, iv 194; cotton rope for driving, xi 143; *Cushing*, hull and machinery, iv 15; evaporators, *Yorktown*, *Baltimore*, *Petrel*, i 293; fuel oils, xv 234; *Majestic*, Br., vii 167; *Mississippi* and *Idaho*, xvi 39; *New Hampshire*, xvi 1266; *North Carolina* and *Montana*, xvi 1266; of storage batteries for torpedo-boat propulsion, xi 56; of war ships increased by modern accessories, xv 350; *Orlando*, Br., comparison, designed and completed, i 92; relative boiler, boiler report, xvi 931; unnecessary on vessels, xvi 117; *Victorious*, Br., vii 813; water-tube boilers vs. cylindrical.....xiv 411
Weights, boiler: iv 703; *Arkansas*, *Nevada*, *Wyoming*, *Florida*, compared, xv 576; *Carnot*, Fr., D'Allest, vii 385; *Charleston*, iv 703; *Colorado*, xvi 1134; *Columbia*, iv 703; *Concord*, iv 703; *Cushing*, iv 703; comparative, cylindrical, locomotive, and water-tube, vii 121; cylindrical and water-tube, for passenger steamer of 10,000 H.P., ix 674; *Florida*, xv 565; *Geiser*, Den., Thornycroft, v 167; *Kassarsky*, Rus., Schichau and *Geiser*, Den., Thornycroft, v 170; locomotive and Thornycroft, vi 350; *Monterey*, iv 703, vi 662; *New York*, iv 703, vi 61; Niclausse and Scotch compared, x 118; of torpedo boats, viii 787; on

some British vessels, viii 567; relative, British report, xvi 931; *San Francisco*, iv 703; *Trenton*, iv 703; water-tube vs. cylindrical, xiv 411, xv 941; (see Boilers, weights.)
Weights, launching: *D'Entrecasteaux*, Fr., viii 626; *Hannibal*, Br., viii 612; *Illustrious*, Br., viii 810; *Pennsylvania*, mer. str.....viii 862
Weights, machinery: *Albatross*, Fish Com. str., vi 507; *Annapolis*, ix 566; *Argonaut* and *Diadem*, Br., xi 364; *Ariete*, Sp., i 183; *Bancroft*, v 376; *Bennington*, iii 212; *Blakely*, xvi 1089; *Brooklyn*, viii 760; *Bugeaud*, Fr., vii 409; *Castine*, v 861; *Charleston*, i 320; *Chasseloup-Laubat*, Fr., vii 409; *Cleveland*, xv 1126; comment on penalty for, xv 1139; *Colorado*, xvi 1134; *Columbia*, vi 35; *Condor*, It., xii 78; criticism on allotment, v 103; *Daring*, Br., vii 725; *Decatur*, xiv 69; *De Long*, xiv 841; *Denver*, xvi 623; *Des Moines*, xvi 233; *Diadem* and *Powerful*, Br., Belleville boilers, compared with cylindrical-boilered ships, x 433; *Duke of Edinburgh*, Br., xvi 262; *Florida*, xv 575; *Foote*, ix 665; *Friant*, Fr., vii 409; *Gwin*, x 500; *Helena*, ix 370; *Hopkins*, xv 711; *Hudson*, U. S. R. C., v 707; *Hull*, xv 711; *Ignazio Florio*, It., viii 869; *Iona*, mer. str., iii 377; *Katahdin*, viii 18; *Machias*, v 861; *Magicienne* and class, Br., i 87; *Maine* (old), vii 26; *Marblehead*, vi 141; *Marco Polo*, It., viii 634; *Medea* and class, Br., i 87; *Monterey*, v 134; *Morris*, x 508; *Nashville*, ix 587; *Newark*, iii 112; *New York*, v 630; *Norman*, mer. str., vii 191; of British warships, vii 348, 364; *Olympia*, vi 255; *Oregon*, viii 471; *Perry*, *Paul Jones*, *Preble*, xiv 793; *Philadelphia*, ii 531; representative modern steamers, naval and mercantile, viii 567; *Royal Sovereign*, Br., iv 298; *San Francisco*, ii 548; *San Francisco* and *Trenton* compared, iv 723; *Satellit*, Aus., vii 394, 423; *Shubrick*, xiii 600; steam cutters, U. S. Navy, xiv 45; *Stewart*, xv 116; *Talbot*, x 500; *Texas*, viii 86; *Thornton*, xiii 600; *Tingy*, xvi 63; total per I.H.P. of various classes of vessels, ix 692; *Truxtun*, xiv 1094; *Turbinia*, yacht, ix 376; turbine and reciprocating compared, xiii 441; *Ville de Douvres*, mer. str., iv 413, 546; *Whipple*, xiv 1094; *Wilkes*, xiv 861; *Wilmington*, ix 370; *Worden*, xiv 1094; *Yorktown*.....i 143
Weir: boilers, combustion-space arrangement, advantages of, x 728; evaporators, vii 490; feed heaters.....iv 399
Weir, James.—The problem of combustion in water-tube boilers, and a means of its solution.....x 723
Weissenburg, Ger., coal-consumption and boiler data.....xiv 116
Welded steel steam pipes.—Hill.....vi 731
Welding: electric, vi 774; of rails, xi 1079; new system, xiii 203; steels, xiv 168
Welland, Br., launch, xvi 691; des.....xvi 1005
Wellington coals, notes on.....i 71
Wells, Edwin, Chief Engr., U. S. N.—Obituary.....i 96
Werra, mer. str., data.....vi 162
Westinghouse brake.....xi 1071
Westinghouse-Parsons steam turbines, xiii 112, 125, xvi 217; tests.....xvi 182
West Virginia, characteristics, xii 810; boilers, Babcock & Wilcox, xvi 1223; trials.....xvi 1311

Wetherbee, Charles P.—U. S. torpedo boats *Bagley*, *Barney* and *Biddle*, xiii 651
Wetmore, Chas. W., mer. str., des.....iv 453
Wettin, Ger., launch and data, xiii 784; data.....xiv 974
Whaleback: building on the Pacific, iv 868; built in England, v 762; steamers.—Goodall.....iv 453
Wharton, B. B. H., Chief Engr., U. S. N., retired.—Obituary.....xiii 328
What is the efficiency of an air compressor?—Richards.....x 1034
Wheel grooves, form of for rope drives.....xi 135
Wheeler, Erastus C.—Malleable cast iron.....xi 161
Wheeler, Frederick Meriam.—Discussion, effect of auxiliaries on economical speed, v 474; discussion, air pumps, vi 546; discussion, steam consumption of the *Minneapolis*.....x 59
Wheeling, gunboat *No. 14*, named, viii 799; launch, ix 401; des. and contract trial, progressive, ix 641; runs, x 826; steaming radius.....xiii 68
Whipple, destroyer *No. 15*, named, x 818; launch, xiii 770; full data, xiii 1082; speed, xiv 948; contract and progressive trial.....xiv 1083
Whistle valve, automatic, balanced.....xi 201
Whitaker, Ezra J., Chief Engr., U. S. N., retired.—Obituary.....vii 635
White boilers: vi 365; ships fitted with, data.....xiv 498
White patent steam turnabout life launches.—Bennett.....ii 222
White, Geo. H., Chief Engr., U. S. N.—Obituary.....iii 613
White, Sir Wm. H., Director of Naval Construction, R. N.—Effect of depth of water on speeds of ships, iv 281; experiments with basic steel, iv 432; discussion, induced draft and hot air, combined, in boilers fitted with "Serve" tubes and retarders, v 841; discussion, present position of water-tube boilers for marine purposes, v 957; comment on loss of *Victoria*, vi 37; discussion, cylindrical vs. water-tube boilers, vi 393; the qualities and performances of recent first-class battleships, vi 464; further experience with first-class battleships, vii 538; discussion, watertight doors, viii 336; discussion, German men-of-war, viii 555; discussion, effect of direction of turning of twin screws, x 491; discussion, logical arrangement of motive power of warships, xi 672; the progress in steam navigation, xi 904; discussion, design of a fast scout, xiii 418; rotation of propellers, xvi 119; turbines, xvi 295; triple and multiple screws, xvi 298; twin screws, xvi 297; water-tube boilers, xvi 301; model experiments and progressive steam trials, xvi 306; screw propellers.....xvi 307
White, William Russell, Lieut., U. S. N.—Official trials of submarine boats *Adder* and *Moccasin*.....xv 39
White, W. W., P. A. Engr., U. S. N.—Steam consumption of the main and auxiliary machinery of the U. S. S. *Minneapolis*, x 1; reply to discussion, x 80; test of the machinery of the Minnesota S. S. Co.'s steamer *Pennsylvania*.....xi 557
Whitgift, see *Nero*.
Whitham, Jay M.—The use of retarders in Scotch boilers, viii 777; trials, of the Niclausse safty water-tube boiler, x 110; discussion, the Diesel motor.....x 182

Whiting, Br., des., i 358; launch, viii 841; speed.....ix 420
Whiting, W. H., Asst. Director of Naval Construction, R. N.—On the effect of modern accessories on the size and cost of warships.....xv 350
Whitworth's screws.....xii 481
Widgeon, Br., trials.....ii 235, xvi 688
Wien, Aus., launch, vii 811; speed, ix 141; trials.....x 222
Wilcannia, mer. str., data.....xi 808
Wild Duck, yacht, boiler test.....vii 79
Wilkes, torpedo boat *No. 35*, named, x 818; full data, xiii 1082; launch, xiii 1084; contract and standardization trial.....xiv 856
Willada, yacht, des.....xi 545
Willans high-speed engines.....ix 701
Willa-Walla, yacht, des.....viii 661
William Windom, U. S. R. C., des., v 988; data.....x 534
Williams, Harvey D.—Strength of U. S. standard bolts, xiii 339; balance of a four-cylinder, triple-expansion marine engine.....xiv 121
Willis, Edward J.—Comparison of indicators.....v 1025
Willis' electric telegraph, engine room signals.....iii 200
Willits, A. B., Comdr., U. S. N.—Contract trial of United States triple-screw protected cruiser *Minneapolis*, vi 702; discussion, experimental station and engineer school, vii 471; object lessons, the lens and pencil in mechanical engineering, xi 692; piping, shafts, etc., xi 897; bearing metals, forgings, piping and steam-engine progress, xii 130; regarding useful information, xvi 1157; new form of steam- and hand-operated stop and throttle valve.....xvi 1240
Willits, G. S., Lt. Comdr., U. S. N.—Serve's ribbed boiler tubes, iii 345; some notes on marine shafting forgings, xiv 226; steel castings.....xv 122
Wilmington, v 1037, vi 176; des., v 727; launch, vii 804; contract trials, ix 360; steaming radius.....xiii 68
Wilmore, Prof. Jno. J.—Shrink and force fits.....xi 106
Wilmot, R. W., see *Potomac*.
Wilson, Admiral, R. N.—Discussion, water-tight doors.....viii 335
Winchell, W. P., Asst. Engr., U. S. N.—Discussion, trial trips and the lessons to be learned from them.....iii 171
Winches, electric, for ships.....viii 574
Windom, see *William Windom*.
Wingfield, C. H.—Discussion, water-tube boilers, viii 512; discussion, Yarrow's feed-water heater.....x 414
Winifred, mer. str., data, x 903; trials.....x 982
Winslow, torpedo boat *No. 5*, repairs, x 221; trial, x 219; data, x 818; full data.....xiii 1082
Winthrop, see *Osceola*.
Winyah, mer. str., tests of retarders in Scotch boilers of.....viii 777
Wire, steel, method of measuring sag of.....ix 726
Wireless telegraphy in the Navy, xiv 278; tests, xi 1034; Marconi, naval tests, xi 776; Slaby-Arco system, used by Germany.....xiv 932
Wireless telephony.....xi 1077

Wisconsin, bids and engines, viii 596, 797; launch, xi 232; contract trial, xii 979; auxiliary machinery.....xii 992
Wisconsin and class, coal consumption .....xv 366, 379
Wise, P. H., see *Sioux*.
Wittelsback, Ger., des., xii 840; data.....xiv 974
Wittick, Mary, auxiliary navy.....x 539
Wizard, Br., des., i 358; machinery, viii 620; speed.....x 864
Woewoda, Rus., des., v 228; trial.....v 752
Wolf, Br., coal consumption, x 240; trials.....x 572
Wolvin, Augustus B., mer. str., launch and des., xvi 709; unloading record .....xvi 1302
Wompatuk, data.....x 534
Wood: carving, vi 837; green or freshly hewn, as fuel, xii 100; framework, painting, v 713; omitted from German men-of-war.....viii 551
Wooden sheathing of the U. S. S. *Chesapeake*.....xi 1051
Woods, Prof. Arthur T.—Obituary.....v 255
Woodbury, data.....x 534
Woodlark, Br., trials.....x 563
Worden, destroyer *No. 16*, named, x 818; launch, xiii 770; full data, xiii 1082; contract and progressive trial.....xiv 1083
Work book, engineer division.....xiii 933
Work done in hammering.....x 1154
Work of the *Oregon* during the Spanish-American war.—Offley.....xv 1144
Working engines at low power.....vi 592
World's coal reserve.....x 776
Wörth, Ger., launch and des., iv 846; trials, vi 808; engine data, vii 430; coal-consumption and boiler data, xiv 116; progress on.....xvi 356
Worthington: marine feed-water heater, v 342; pumping engine and boilers, tests of at New Bedford, Mass., i 299; pumping engines, test of, New Bedford, Mass.....ii 26
Worthington, Walter F., Comdr., U. S. N.—Discussion, engine-room signals, iii 444; bilge drainage, iv 92; translation, transmission and distribution of power on modern ships, iv 173; translation, water-tube boilers.—Soliani, vii 97; discussion, steam consumption of the *Minneapolis*, x 78; corrosion of boiler tubes in the U. S. Navy, xii 587, 907, xiii 333, 822; notes from abroad.....xvi 886
Wound copper pipes, tests of.....vii 510
Wright, Sir James.—Obituary.....xi 552
Wrought iron: case-hardened, xiv 590; extension of.....xi 204
Wurttemberg, Ger., rod pressure, xiv 21; cylinder data, xiv 37; coal-consumption and boiler data, Schulz.....xiv 117
Wyoming, Act of Congress, x 813; bids, x 1169; launch, xii 1094; trials, xiv 1237; contract and progressive trials, xv 83; comparison of monitor performances.....xv 823

X

X-rays in metallography.....xi 230

Y

Yachts.
Aegusa, des., ix 448; *Alcedo*, des., vii 854, ix 446; pump, ix 844; *Almy*, des. and trials, iv 131; *Alvina*, des., xiii 321; *America's* Cup defenders, v 650; *American*, launch, x 936; *Andria*, dimensions, ix 449; *Anita*, dimensions, viii 213; data, viii 663; *Annett*, des., ix 843; *Aphrodite*, des., xi 274; *Arcturus*, des., vii 856; speed, viii 213; *Arrow*, des., xiii 321, xiv 1286; *Atmah*, launch.....x 937
Ballymena, data of quadruple-expansion engines, i 81; *Beatrice*, data, viii 433; Boston defender, data.....xiii 321
Calypso, des., vii 631; *Catania*, des., vii 628; *Chetolah*, des., x 615; *Chil Howee*, des., xi 277; *Christine*, dimensions, ix 211; *Clara*, tests to determine a continuous record of engines, ix 6; *Cochno*, launch, x 938; *Columbia*, des., vi 220; launch, x 936; races, xiii 809; *Comanche*, des., iv 324; *Constitution*, des.....xiii 545
Daimler, data, x 938; defenders of *America's* cup, 1893, *Vigilant*, *Colonia*, *Jubilee*, *Pilgrim*, data of, v 998; Detroit Boat Works, building, vii 446; *Dreamer*, data, xii 270; *Dungeness*, des.....vi 221
Eleanor, data, vi 420; *Electra*, des., x 301; *Ellida*, dimensions, vi 645; *Ellide*, des., ix 447, xi 272; *El Primero*, trials, v 1090; *Endion*, des., x 930; *Enquirer*, dimensions, viii 434; *Ethel*, propeller trials, v 302; *Eugenie*, launch.....ix 212
Fast small, *Feiseen*, v 249; *Fauvette*, data, vi 440; *Felicia*, des., x 614; *Formosa*, des., vi 441, 644; *Foros*, data, vi 440; *Free Lance*, des...vii 628
Giralda, des., vii 196, viii 432; winner of Bennett race, vii 445; *Grace Darling*, data of quadruple-expansion engines.....i 77
Hiawatha, des., viii 214, ix 208; launch, ix 446; *Huntress*, launch and des.....vii 630
Illawara, des., viii 215; *Independence*, des., xiii 551; races, xiii 809; *Iolaire*, launch and des., viii 213; *Ivy*, des.....ix 212
Josephine, des., viii 211; launch and machinery.....viii 431
Kanawha, dimensions.....viii 433
La Belle Sauvage, trial, vii 199; des., vi 842; Ladew's, xi 813; *Lady Frances*, des., xii 582; *Latharna*, launch, ix 449; *Leon Pauilhac*, dimensions, ix 449; *Lleyellyn*, des., x 616; *Lorena*, turbines, xvi 715, 1095; *Lysistrata*, data, xii 1131; des.....xiii 556
Malay, des., x 934; *Margaret*, des., x 931; *Margarita* (two), des., vi 441, viii 660, xii 270; dimensions, viii 213, xiii 323; speed, viii 873; *Margarita II*, correction of name, ix 446; *Marietta*, des., ix 207; launch, ix 446; *Marietta II*, machinery, ix 211 (should be *Margarita II*); *Mayflower*, dimensions, ix 210; *Monsoon*, trial, vii 629; Morgan's des., viii 212; Mosher's design, viii 874; *Myrtle*, data of quadruple-expansion engines.....i 80
Namouna, des., v 1084, vi 440; naphtha, des., viii 216; *Navahoe*, des., v 650; *New Alcyone*, des., vii 445; *Niagara*, des., x 296; data, x 941; *Niagara II*, des.....ix 841
Oneonta, launch and des., vii 630; des. and data, x 398; *Orienta*, des., xiii 558; *Osceola*, des.....x 939

Yachts.
Parthenia, launch and des., viii 661; des. and data, x 395; *Penelope*, des., x 399; *Peregrine*, des., vii 630; *Pilgrim*, changes in, vi 441; *Princess Alice*, speed, x 938; *Prinzessin Victoria Luise*, des., xiii 323; purchase during Spanish war.....x 534
Race, steam, 1894, vi 440; races, 1893, *America's* cup, v 998; races, February 27, 1894, entries for, vi 440; *Rona*, des., vi 221; *Rosabelle*, des.....ix 448
Saranac, des., x 933; *Scud*, des., viii 662; boilers, viii 874; Seabury & Co., building, vi 842; *Shearwater*, Belleville boilers, ii 484; *Sir Christopher Furness*, note, xiv 1002; *Skeandhu*, data of quadruple-expansion engines, i 77; *Sovereign*, des., viii 434. 659, 873, x 611; *Speedy*, dimensions, viii 434; des., viii 875; *Standart*, des., x 287; steam, American, x 393; steam launches.....x 934
Tarantula, turbine installation, xvi 1095; new boilers, xvi 1341; *Thespia*, launch and des., vii 630; *Tide*, des., x 402; Tower's new, x 1227; Trinity House, data, x 937; two, 1898, des.....x 1226
Urania, des.....vii 629
Valiant, des., v 759, 1078; speed, vi 223; *Valkyrie*, *America's* cup races, 1893, v 1004; *Varuna*, des., ix 210; *Veglia*, des., vii 628; *Vendenese*, made of aluminum, vi 165; *Vigilant*, *America's* cup races, 1893, v 1001; *Victoria and Albert*, machinery, xi 810; des., xii 1130; note, xiii 780; data.....xiii 1108
Wachusett, dimensions, viii 663; *Wacouta*, des. and trials, xiv 1151; *Weetamoe*, des., xiv 706; Widener's new, des., x 1225; *Wild Duck*, boiler test, vii 79; *Willa-Walla*, des., viii 661; *Willada*, des.....xi 545
Yosemite, des. and trials, vii 668; *Zeta*, des., vi 441; *Zoraide*, des....vi 644
Yale, auxiliary navy, x 539; data.....x 824
Yakumo, Jap., data, x 581; dimensions.....xi 1113
Yamuri, see *Badger*.
Yalu, battle of, its effect on construction of warships.....viii 370
Yankee, data.....x 534
Yankton, auxiliary navy, x 538; data.....x 824
Yarrow, A. F.: on balancing marine engines and the vibration of vessels, iv 246; discussion, transmission of heat through tube plates, v 454; discussion, present position of water-tube boilers for marine purposes, v 952; discussion, cylindrical vs. water-tube boilers, vi 388; on progressive trials of *Hornet*, Br., vii 733; discussion, water-tube boilers, viii 505; discussion, compound marine steam turbines, ix 381; novel arrangement of feed-water heater in water-tube boilers, x 409; reply to discussion, x 420; discussion, recent trials of the cruiser *Diadem*, x 438; discussion, water-tube boilers a necessity, xi 23; some experiments having reference to the durability of water-tube boilers, xi 633; discussion, torpedo-boat destroyers.....xiv 396
Yarrow boilers: v 947, vi 363, viii 589, 792; *Amethyst*, Br., xvi 1246; *Antrim*, Br., xiv 920; British cruisers, xiv 234; bulged steam drum, xi 694; circulation shown by model, viii 493; compared with others, xiv 419; destroyers, Br., *Hornet* and *Salmon*, vii 797; development for

Yachts.
use in battleships, xv 834; *Friesland*, Hol., viii 406, 792; *Hampshire*, Br., xiv 921; *Hertag Hendrik*, Hol., xiv 339; in navies, xvi 292; large-tube, boiler committee report, xiv 875; British report, xvi 920; interim report of the boiler committee, xiii 358; *Medea*, Br., xiv 643, xvi 336; *Nashville*, ix 584; replaced by Mosher boilers in *Tarantula*, xvi 1341; salt-water feed for, ix 388; ships fitted with, data, xiv 506; tests.....vi 163
Yarrow's experiments on boiler circulation.....viii 133
Yarrow's: feed-regulator, viii 792; feed-water heater.....x 409
Yarrow-Schlick-Tweedy system of balancing engines, x 481; *Longmoon*, mer. str.....viii 655
Yaryan evaporators.....vii 493
Yaryan, H. T.—Hot-water heating from a central station.....xii 421
Yashima, Jap., launch and des., viii 414; trials and machinery.....ix 818
Yastreb, Rus., trials.....xiv 365
Yawata Maru, mer. str., des.....x 1223
Yenesei, Rus., trials.....xiv 366
York, Ger., launch.....xvi 1016
Yorktown, readiness for trial, i 83; contractor's full-power forced-draft trial, i 137; authorization and data, i 236; machinery space, i 249; preliminary trials, i 252; combined indicator cards, i 268; test of evaporators, i 291; trials, measured mile, i 355; engine vibrations, iii 16; engine and boiler data, iii 422; propeller data, iv 158, 402; trials, progressive, iv 587; coal endurance, iv 641, 642; economical speed and coal per I.H.P., iv 671; air-pump data, vi 532; steaming radius, xiii 68; thrust dynamometers for.....i 36
Yorktown, *Concord*, *Bennington*, trial results compared, iii 216; power of auxiliary machinery.....iii 217
Yorktown, mer. str., des.....vi 430
Yorktown, see *Resolute*.
Yosemite, auxiliary navy, data, x 534; loss of, xii 1097; steaming radius, xiii 68
Yosemite, yacht, des. and trials.....vii 668
Yoshino, Jap., launch and des., v 231; trial, v 1068; des.....xiv 345, 357
Yukon, towing steamers for.....x 740

Z

Zafiro, data.....x 534
Zähringen, Ger., launch, xiii 785; des.....xiv 974, 975
Zebra, Br., launch, viii 181; machinery.....viii 621
Zeeland, Hol., des., vii 829; boilers, Yarrow.....viii 406, 792, x 887
Zeeland, mer. str., data.....xiii 543
Zeffiro, It., accident to.....xvi 1019
Zélée, Fr., dimensions, x 887; trials.....xii 839
Zélie, Fr., stern-wheel gunboat.....vii 173
Zeller, Theodore, Commodore, U. S. N.—Obituary.....xiii 811
Zenith City, mer. str., des., vii 621; trials, vii 765; valve gear data.....xii 761

Zenta, Aus., launch and des.....ix 796
Zepher, Br., trials.....xiii 271
Zeta, yacht, des.....vi 441
Zeuner diagrams.....xii 951
Zinc: as a protective coating for iron and steel, xii 789; in boilers, iii 189; of *Cushing*, iv 44; -iron-copper alloys, iii 493; production, Russia...xii 1084
Zoraide, yacht, des.....vi 644
Zouave, Fr., trials.....iv 527
Zuhaf, Turk., launch.....vi 810